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ABSTRACT

Two studies compared the visual preferences, cognitive abilities, and occupational interests of artists and nonartists. Study One compared scores on an experimental battery of artistic judgment tests for three groups: professional artists, Johnson O'Connor Research Foundation examinees in art-related professions, and Foundation examinees not in those fields. Study Two compared the two groups of Foundation examinees on the standard Foundation battery and the interest scales of the Career Occupational Preference System (COPS). In Study One, the artists and nonartists differed significantly on all tests in the experimental battery. On the Barron-Welsh Art Scale (BWAS), the professional artists scored significantly higher than a nonartist sample studied previously. In Study Two, on the standard battery tests, artists scored significantly higher than nonartists in Inductive Reasoning, Structural Visualization, Paper Folding, Memory for Design, Observation, and Tweezer Dexterity. Study Two also showed that artists and nonartists differed in their occupational interests, with artists showing significantly higher interest in artistic occupations, and significantly less in science, business, and computation related fields. The Design Judgment Test, Visual Design Test scales, and the Proportion Appraisal Consensus and .67 scales were shown to be valid in distinguishing artists from nonartists. Further research should be conducted into the relationship between artistic judgment and education and training in the visual arts. (Contains 104 references and four appendices.) (Author/SG)

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ARTISTIC JUDGMENT III:

ARTIST VALIDATION

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Artistic Judgment Project III: Artist Validation

Nikolaus Bezruczko and David H. Schroeder

ABSTRACT

Two studies were conducted that compared the visual preferences, cognitive abilities, and occupational interests of artists and nonartists. In Study One, we compared scores on an experimental battery of artistic judgment tests for three groups: a sample of specially recruited professional artists and a sample of Foundation examinees divided into those in art-related occupations and those not. In Study Two, the two groups of Foundation examinees were compared on the standard Foundation battery and the interest scales of the Career Occupational Preference System (COPS).

In Study One, the artists and nonartists differed significantly on all the tests in the experimental battery. The differences between the professional artists and the Foundation-examinee nonartists, after differences in socioeconomic background were controlled, were greatest on the Design Judgment Test (DJT), followed by the Visual Aesthetic Sensitivity Test (VAST). The effect for the VAST, however, was in the opposite direction from expectation. On the Barron-Welsh Art Scale (BWAS), the professional artists scored substantially higher than a nonartist sample studied previously (Barron, 1953).

In Study Two, on the standard battery tests, the examinee artists scored significantly higher than the nonartists on Inductive Reasoning, Structural Visualization, Paper Folding, Memory For Design, Observation, and Tweezer Dexterity. The differences ranged from .28 to .41 standard deviation units. Trends were found between artist status and tests measuring Analytical Reasoning, Silograms, Finger Dexterity, and English Vocabulary, although these relationships were smaller in magnitude.

Study Two also showed that artists and nonartists differed in their occupational interests, with the artists showing significantly greater interest in artistic occupations. The magnitude of the difference on the Arts-Design scale was .72 standard deviation units. The artists also showed significantly less interest in occupations related to Science-Medical-Life, Business-Finance, and Computation.

In conclusion, the DJT, the two Visual Design Test scales, and the Proportion Appraisal Consensus and .67 scales were shown to be (in varying degrees) valid in

terms of distinguishing artists from nonartists. Because the DJT and the VDT scales also show good reliability and discriminant validity, it is recommended that the Foundation consider using them in its standard testing battery. Further research should be conducted into the relationship between artistic judgment and education and training in the visual arts.

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In this, the last in this series of technical reports concerning artistic judgment, we have attempted to reach a point of closure on the reliability and validity of several artistic judgment tests. As in prior reports, we gratefully acknowledge the cooperation and assistance of the test administrators of the Washington, DC, New Orleans, Dallas/Fort Worth, Houston, Denver, Seattle, and Philadelphia offices in collecting data for this project. The staff of the Research Department in Chicago, as well, provided a valuable service in the accurate entry and processing of these data, thus contributing to the validity of our results.

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This report, however, differs from the earlier ones because of the extensive support, as well as active participation, that we have received from many persons outside the Foundation, which made these studies possible. Our thanks go first to the professional artists in the study. While artists in general are interested in the topic of artistic judgment, convincing them of the usefulness of developing tests of aptitude and persuading them to commit their time for testing and interviewing are difficult. Thus we are deeply indebted to the entire sample of professional artists for their contribution. The commitment of these persons to their art careers and the diversity of their backgrounds, we believe, led to the success of these studies.

In addition, because of their role in both identifying professional artists to participate in this project and providing us with expert knowledge during the studies, we would like to acknowledge the assistance we received from the following persons: Ms. Linda Faucheux, Ms. Diana Foster, and Ms. Arlene Rakoncay.

Ms. Faucheux, formerly of the Johnson O'Connor Research Foundation testing office in New Orleans, provided a key service in organizing and conducting the testing of the artists in New Orleans. She recruited a sample of professional artists, administered the tests and the questionnaire for this project, and collected extensive biographical information at her own time and expense. We are indebted to her for her personal interest and conscientious assistance because her contribution substantially increased the usefulness of this report.

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INTRODUCTION

This is the third report in a series that presents the results of a project to study several tests of artistic judgment conducted by the Johnson O'Connor Research Foundation. In the first report, *Artistic Judgment Project I: Internal-Structure Analyses* (Technical Report 1989-2), we described the internal psychometric properties of several tests of artistic judgment that were administered to a sample of Foundation examinees. Our goal was to determine the internal consistency of the items, assess their precision in measuring differences between persons, and ascertain whether any of the tests appeared promising as tests of artistic judgment aptitude.

In the second report, *Artistic Judgment II: Construct Validation* (Technical Report 1990-4), we looked at data from this same sample of examinees, but analyzed the relationships of their scores to external criteria of validity that were both art- and nonart-related. We examined the associations of artistic judgment test scores with: (a) the tests in the Foundation's standard aptitude battery, (b) the items on an artistic background questionnaire, (c) occupational interest scales, and (d) biographical data including college majors and years of education for the examinees in the study.

In this report, our goal is to examine the differences in test scores between artists and nonartists on the experimental artistic judgment battery, thus extending our understanding of the validity of these tests. We do so by comparing the test scores for a group of professional artists to the scores for our sample of examinees from the Foundation testing offices. The examinee sample was divided into lay persons ("nonartists") and persons in art-related occupations ("examinee artists"). The comparison between nonartists, examinee artists, and professional artists is the primary focus of this report and, in our opinion, provides definitive validation for the tests in the experimental battery as measures of art-related characteristics.

A secondary focus, in this report, is a comparison between artists and nonartists on tests in the standard Foundation battery and an occupational interest inventory. We do this comparing the examinee artists with the nonartists. The intent of this comparison is to build upon the earlier comparison of artists and nonartists, enriching our understanding of the distinctiveness of artists. The results in this report are reported here as two studies: Study One consists of the comparison between professional artists, examinee artists, and nonartists, while Study Two represents the comparisons between the examinee artists and nonartists in the Foundation sample.

Before reporting the results of these two studies, we describe briefly the background for the artistic judgment project, including descriptions of the

experimental artistic judgment tests and a brief review of the results of the internal-structure and construct-validation analyses.

Background of the Artistic Judgment Project

For many years, researchers at the Foundation and elsewhere have speculated that artistic judgment is associated with one or more aptitudes and related to the production of visual art. Over the last 60 years, the Foundation has experimented with several tests designed to measure artistic judgment including the McAdory Art Test (McAdory, 1929), the Design Judgment Test (Graves, 1948), and Proportion Appraisal (Technical Report 44), but over time the Foundation became dissatisfied with each of them. None of these tests are currently in the Foundation's standard battery or commercially in print, and the search for a valid and reliable test of artistic judgment remains a priority.

The early tests of artistic judgment relied on a method of testing that required examinees to indicate their preference for a design from a selection of two or more. The McAdory Art Test (McAdory, 1929), for example, published by Columbia University Press and the first test of artistic judgment that received wide attention, presented items that consisted of four similar pictures, and the examinee was asked to select, for each item, the picture that he or she liked the best. Unlike earlier researchers (Fechner, 1865; Thorndike, 1916), McAdory selected the pictures for her test items from common magazines and specialized art sources and then created variants for each picture by modifying its line arrangement, shape, or color (McAdory, 1929). Another innovation in the development of the McAdory Art Test was her use of art experts to establish a standard for scoring the responses to test items.

The Design Judgment Test, published by The Psychological Corporation, is another test that has been used widely and assesses preference for visual designs. The author manipulated several design characteristics in the construction of the items, although the portion of the test that we administered, a 22-item subset, presents items that vary primarily in symmetry. An innovation in the Design Judgment Test over earlier tests is its use of nonrepresentational designs.

Proportion Appraisal, developed and used within the Foundation, was constructed in the 1930s to test preference for geometric designs that systematically vary in their shape (this preference was believed to be related to general artistic judgment). This emphasis on shape as an influence on preference is consistent with a principle in art theory, first discussed by the ancient Greeks, which states that the proportions of an artwork fundamentally influence its attractiveness (see later section for details).

Although each of these tests showed promise, each also had limitations, as will be discussed.

Review of Artistic Judgment Testing

Beginning in 1985, the Foundation undertook a review of the empirical research on artistic judgment that has been conducted outside the Foundation. Bezruczko (Technical Report 1988-1) found three primary approaches to the study of artistic judgment, namely, psychophysics and mathematics, mental testing and psychometrics, and a psychobiological approach that implements principles of information theory; the approaches are summarized briefly below.

Psychophysics and mathematics. The earliest empirical work in this area appeared between 1865 and 1876 (Fechner, 1865, 1876), when Fechner developed objective methods for investigating differences between persons in their preference for controlled visual stimuli. While his intention was to demonstrate an empirical basis for his personally held philosophical convictions, the most influential aspects of his studies were not his results but rather the empirical methods that he developed, now referred to as psychophysics. They have become widely applied in all areas of psychology and form the foundation for the modern science of mental testing.

Following the psychophysical tradition, Birkhoff, a prominent mathematician of the 20th century, formulated a mathematical treatment of artistic judgment (Birkhoff, 1932; see also Birkhoff, 1956). He speculated that aesthetic experience consists of perceptual phases in which, respectively, the complexity, aesthetic value, and order of an object influence the formation of an artistic judgment. Although he constructed a set of polygons based on his model, he never tested the model empirically, and subsequent research has not supported it.

Mental testing and psychometrics. A second approach to artistic judgment developed with the rise of the mental testing movement during the early 20th century. Beginning in 1910, tests of artistic judgment were developed, with Thorndike (1916) and McAdory (1929) conducting some of the earliest studies. Their work was followed by many other attempts to develop instruments that measured artistic judgment, with the Meier Art Tests (Meier, 1928, 1942, 1963) and the Design Judgment Test (Graves 1946, 1948) the most thoroughly researched and widely used.

Simultaneous with the development of a testing approach to artistic judgment was psychometric research into the primary factors that underlie a person's preference for visual designs. The most noted research in this area was by Eysenck (1940, 1941), who conducted extensive studies involving many samples. He found substantial evidence for a general preference factor ("T," for taste) that

extends across all preference judgments and suggested that this general factor has a neurological origin and constitutes the basis for fundamental perceptual differences between persons (Eysenck, 1957). Further research yielded another factor, "K," on which artists and nonartists differ in their preferences. T is a common factor that reflects aspects of visual designs, such as order and harmony, on which artists and nonartists agree, while K is a factor that discriminates between them, with artists preferring lesser complexity than nonartists.

Psychobiological approach. The psychophysical/mathematical and testing approaches were followed by a third approach in the 1960s led by Berlyne (1971, 1974). Relying heavily upon psychobiological theory, Berlyne proposed a model in which persons differ in their preference for visual complexity because of a preferred or optimal level of arousal and show differences in their need for visual stimulation. His empirical studies showed very explicitly that visual complexity is a powerful influence on preference, and he presented a neurological processing model, implementing concepts from information theory, to explain the underlying process involved in forming a visual preference. Unfortunately, his studies did not examine systematically the differences between artists and nonartists, and thus his statements concerning complexity and preference have led to considerable confusion concerning their relationships both to artistic judgment and human behavior in general.

Summary of literature review. The research most directly applicable to the measurement of artistic judgment is the factor analytic studies by Eysenck. They showed that several factors underlie visual preference (Eysenck, 1940, 1941, 1970, 1972a) and that the two most important factors are T and K.

Despite decades of empirical investigation, however, research into visual preference variables has not led to an understanding or clarification of their role in artistic judgment or their usefulness for aptitude testing. Researchers disagree on the prevalence of a common factor for artistic judgment (Child, 1964) and do not agree on the association between complexity and artists' preference. While Eysenck (1940, 1941, 1970, 1972a) and Brighouse (1939) found that artists prefer less-complex designs and nonartists more-complex designs, Munsinger and Kesson (1964) reported the opposite relationship, as did Barron and Welsh (1952) and others (Eisenman, 1966; Eisenman & Rappaport, 1967). The influence of order on artist preference also is not clear. Birkhoff, in a test of the preference for polygons, emphasized the influence of order, while Attneave (1959) and Garner (1970) discussed the influence of repetition, or redundancy. Similarly, the difference between the preferences of artists and nonartists for symmetry is emphasized by Graves (1948) but not replicated by other researchers (Eysenck, 1970; Eysenck & Castle, 1971; Götz & Götz, 1974).

Despite their inconsistencies, these earlier studies of artistic judgment tend to link differences in visual preferences between artists and nonartists to several types of visual designs, including: asymmetrical designs (Eysenck, 1970), polygons characterized by low levels of complexity (Eysenck, 1968, 1972a; see also Eysenck & Castle, 1970b), and paintings characterized by order, balance, and harmony. Similarly, the inconclusiveness of research concerning a general statistical factor T on which artists and nonartists agree has not diminished the practical importance of K, a factor on which they disagree. A substantial amount of evidence shows significant group differences between artists and nonartists on K, although no standardized instruments to our knowledge have used this factor to measure artistic judgment.

The question of interest to the Foundation--Is artistic judgment an aptitude?--is not addressed directly in the research literature. The literature concerning the measurement of artistic judgment tends to assume that persons differ in their visual preferences and that some persons have a special capacity to make artistic judgments. Artistic judgment, however, is generally not discussed explicitly as an aptitude, although differences in artistic judgment are expected to occur independently of training or education.

Problems With Artistic Judgment Testing

Empirical studies of the preference judgments that persons make when choosing designs have identified several problems with using these judgments to test artistic judgment. These problems include the operational definition of the variables that the tests are intended to measure, the methods used to validate the constructs that underlie the tests, the psychometric properties of the items in the tests, and the aesthetic value of the designs used in the tests. These problems are discussed briefly below.

Construction of designs. The concepts on which many tests of artistic judgment are based are vague and ambiguous, and the construction of designs for them oftentimes appears arbitrary. The Design Judgment Test (full-length version) illustrates this problem. The author describes the construction of the designs in terms of the "basic principles of order - unity, dominance, balance, continuity, symmetry, proportion [and so on] . . ." (Graves, 1948) but does not provide an explicit description or systematic explanation for how these characteristics are manipulated in the designs. In the Design Judgment Test, this problem is not severe because the designs are relatively simple, so that we can infer the underlying principles through simple inspection. But other tests, such as the Barron-Welsh Art Scale, despite decades of research, are still not adequately understood. The Barron-Welsh Art Scale was not based on explicit criteria that were systematically implemented in the construction of its designs, and thus researchers have speculated about, but never resolved, a question concerning its

underlying construct. Researchers have been inclined to characterize the construct as a contrast between preferences for simple and complex designs (Barron, 1953, 1982) or for some other particular characteristic of the items. Because this interpretation is ad hoc, it is always open to reinterpretation and revision, thus ultimately confusing a field of study already characterized by ambiguity and uncertainty. The state of affairs for the Design Judgment Test and the Barron-Welsh Art Scale is true in general for the empirical study of artistic judgment.

Unfortunately, when test developers have tried to use objective, systematic methods to develop tests of preference, using only designs with controlled characteristics, such as in Birkhoff's test using polygons that differ primarily in their number of sides, the results have not, in general, been very satisfactory. For example, Child examined the correlates of responses to designs from Birkhoff's test and found only a weak association with art criteria (Child, 1964). While other researchers have developed designs on the basis of quantitative principles (Attneave, 1957; Noll, 1966, 1972), their designs have not been assembled into tests.

Criterion validity. The issue of validity, discussed above in relation to the construct for a test, is problematic for artistic judgment tests. Researchers have found that expert art opinion tends not to be stable, with correlations between expert artists sometimes as low as .33 (Getzels & Csikszentmihalyi, 1969). Moreover, the use of criterion groups has shown, in some cases, extreme variability in judgments across generations. In a study of the Design Judgment Test, Eysenck (1970; Eysenck & Castle, 1971) found that the difference between artists and nonartists on the test reported in the 1940s to be 28 points, had diminished twenty years later to a magnitude that was not statistically significant.

An influence on validation results that has not received considerable attention from researchers is the differences in preference that may exist between artistic specialties such as contemporary versus classical art, abstract versus concrete art, or commercial versus fine art. Because these characteristics are usually not controlled in validation studies, their influence is typically unknown, yet probably significant.

Because of these issues, the validity of an artistic judgment test whose scoring key is based solely on expert opinion may be necessarily circumscribed and possibly specific to certain samples and periods in time.

Internal-structural properties. The internal-structural properties of artistic judgment tests, or the degree to which a group of test items correlate with each other to define a common trait or attribute structure, are especially important for determining the extent to which artistic judgment occurs as an individual

difference. Unfortunately, tests of artistic judgment have generally not been analyzed for internal structure, and when they have, they have generally been found to be weak, oftentimes containing several distinct dimensions. This limits the practical usefulness of most tests of artistic judgment for measuring individual differences.

Aesthetic value of designs. One of the methods that researchers have developed for addressing the problems associated with constructing designs and establishing the validity of artistic judgment test items is by objectively manipulating the characteristics of simple shapes and designs. Fechner introduced this method, Thorndike applied it to rectangles, and Birkhoff and Eysenck applied it to polygons; in the Foundation, Proportion Appraisal is based on this approach. According to this method, some aspect of a design such as its complexity or order is manipulated by an explicit operation such as the number of sides of a polygon or the number of intersections in a design, and then such designs are presented to examinees as test items. Based on this method, researchers have identified several features of designs that influence preference.

This approach to constructing designs, while appealing to the empiricist, has had unfortunate consequences for the acceptance of tests of artistic judgment by artists. Artists generally react negatively to these types of designs, stating that they are poorly done and lacking in aesthetic value. Consequently, the validity of this approach for constructing artistic judgment items, prior to our research, was unclear.

Issues concerning individual differences. Investigations into artistic judgment as an individual difference are somewhat problematic because preferences for art tend to be dependent on cultural preferences and social values. Thus an important problem in the study of artistic judgment is distinguishing between transient aspects of art that are primarily determined by convention and popularity and more-enduring aspects determined by fundamental differences in visual preference. Meier (1942) approached this problem by showing that preferences for spatial arrangement are fundamental to artistic judgment and conducting studies to show the basis of visual preference in childhood. Researchers such as Berlyne showed how visual preference can be influenced by the information in categories or components of a visual image, also emphasizing the spatial relationships that underlie any image.

While researchers now generally agree that structural aspects of designs influence preference, the problems involved in developing reliable and valid testing instruments that measure visual preference have severely limited investigations into the empirical link between artistic judgment and differences in structural characteristics of designs. Researchers speculate that genetic differences, sociocultural background, and education and training influence preference, but

without objective research, the extent to which these sources of variation (e.g., genetics, culture, and education) influence preference is not known. In sum, it has not been fully shown that artistic judgment is a reliable individual difference, and, if so, if it is an aptitude.

Recommendations. In order to address the problems and limitations identified in the literature review, and to provide a sound basis on which artistic judgment testing can be conducted, we recommended the following line of research:

1. Administer one or more commercial tests of artistic judgment to a sample of Foundation examinees and to another sample of professional artists outside the Foundation. The results from this study would establish the internal-structure properties of the tests, as well as their construct validity.

2. Construct a set of designs on the basis of design features that have been empirically linked to artist preferences. These designs, unlike the designs in several earlier tests of artistic judgment, would need to have sufficient aesthetic value to be acceptable to artists, and would be used to form a systematic measure of artistic judgment.

On the basis of these recommendations, an experimental battery was organized to compare the following tests of artistic judgment.

The Experimental Artistic Judgment Battery

In order to address questions regarding the reliability and validity of artistic judgment tests, as well as issues concerning their underlying constructs, the Foundation organized a comparison of four artistic judgment tests in an experimental battery. The tests are: the Design Judgment Test (DJT), the Visual Designs Test (VDT), Proportion Appraisal (PA), and the Visual Aesthetic Sensitivity Test (VAST). As described above, the DJT was published commercially for many years, and PA was developed by the Foundation. The VAST was developed by Götz, Lynn, Gorisy, and Eysenck (1979), based on Eysenck's factor analytic studies.

The VDT is a new test developed by Bezruczko at the Foundation specifically for the purpose of clarifying the results of earlier empirical research, namely, the influence of complexity and order on preference. Unlike previous tests of visual preference, the items in the VDT are based on a system of rules for their construction that involve placing visual elements in randomly assigned locations within 8" x 11" visual fields (Technical Report 1988-1) in a minimalist style generally associated with Mondrian (Champa, 1985). Because complexity and order were manipulated as independent factors, it is possible to analyze their

influence on preference separately from each other. The complete item-construction specifications are given in Technical Report 1988-1, pages 36 to 38.

In a preliminary study of preferences for these designs, examinees were asked to rate designs consisting of random patterns that vary in complexity and order on five-point scales (Statistical Bulletin 1986-5). The results indicated that the complexity manipulation accounted for more than 75 percent of the variation in mean ratings for the designs. Based on these results, Bezruczko organized the designs into 86 forced-choice items, each item pairing a more-complex design with a less-complex design, which were administered in this study. The results of the analyses of internal structure and construct validity for the VDT, as well as the other tests in the experimental artistic judgment battery, are summarized below.

Review of Results From the Experimental Artistic Judgment Battery

A brief review of the internal-structural properties and construct-validity results follow below. These results were presented in detail in Technical Reports 1989-2 and 1990-4, respectively.

Internal-structure analyses. The VDT, the DJT, and PA ask examinees to indicate their personal preferences between designs that are presented two or three at a time. The VAST is similar to these tests except that it asks examinees to make objective comparisons of the balance and harmony of designs as they appear in pairs. The Method section of this report contains further details and examples of the items in these tests.

The internal-structure analyses indicated that the VDT has two major factors. One factor (Simplicity) contrasts designs that differ in their complexity, and the other factor (Uniformity) contrasts designs that appear ordered and uniform with designs that appear more-complex and show movement. A factor analysis of the DJT showed that it consists of essentially one factor that we interpret as the preference for visual asymmetry. We derived scores for both VDT factors that were highly reliable, as was the DJT.

For PA, we first developed two scoring methods, one based on the preferences for which there was a group consensus and another based on the physical proportions of the shapes in the test, both of which also showed reliabilities in the .70s. The reliability for the VAST was .66, clearly below the Foundation standard of .80.

Although each of the tests measures an aspect of artistic judgment, they appear to be largely independent of each other, with the highest intertest

correlation being .30. In spite of their magnitude, the intertest correlations show a pattern that is theoretically meaningful. We found, for example, that the preference for asymmetrical designs is positively associated with the preference for less-complex random designs but negatively associated with the preference for ordered, uniform random patterns. According to previous research (Eysenck 1972a), the preferences for asymmetry and less-complex random designs represent the pattern that one could expect to find for artists. The negative relationship between the preferences for asymmetry and more-uniform random designs, however, is unexpected though not surprising.

We also found that the DJT, Simplicity, and Uniformity are negatively related to Proportion Appraisal when PA responses are scored for agreement with the group consensus. This means that nonartists who tend to like symmetrical designs and random designs with higher complexity tend to prefer shapes that conform to conventional standards of taste. Not surprisingly, this result is consistent with previous research that shows artists are significantly higher in a personality characteristic called independence of judgment (Child, 1965) and thus not inhibited from forming preferences that differ from conventional standards.

Construct-validity analyses. The construct validity analyses examined the associations of the experimental artistic judgment battery with art- and non-art-related criteria external to the respective tests. These criteria included the associations between the artistic judgment tests and the aptitude tests in the Foundation battery, items from an artistic background questionnaire, and scales from an occupational interest survey, as well as biographical data regarding college major and years of education.

The purpose of these analyses was to obtain evidence concerning the following issues: (a) the independence of test scores from the standard Foundation aptitude battery, (b) evidence that the responses to the items on these tests are associated with art-related activities, and (c) evidence for a general variable, or some higher-order structure, that underlies the preferences for the designs on these tests.

The results showed that the questionnaire items are somewhat supportive of an association between the DJT, VDT Simplicity, and PA Consensus and external art criteria. The VDT Simplicity scale and the DJT, in particular, showed low but positive correlations with several items that indicated participation in a variety of artistic activities. Although its relationship was weaker, PA Consensus also showed a significant relationship to external art criteria.

Similarly, the results from the *Career Occupational Preference System* (COPS) interest scales suggest that the DJT, Simplicity, and PA Consensus also have associations with interest in art. On both the high school and the college forms of

the scale, DJT showed significant relationships with interest in art fields, as did Simplicity on the high school form and PA Consensus on the college form.

Some of the most interesting and particularly supportive results for the construct validity of these tests, however, come from the analysis of college major. This analysis showed not only that art majors differ systematically from nonartists in their test scores, but also that significant differences in preference exist among art majors. We found that fine art majors showed significantly higher scores than nonartists and business art majors on the DJT and Simplicity, but that they showed the lowest scores on PA Consensus. For this analysis, business art majors consisted of examinees who concentrated in areas such as graphic design, illustration, and commercial art, in contrast to the fine art majors, whose occupational goals for their training were less clearly defined. When we analyzed the differences between the fine art and business art majors on the DJT and Simplicity, however, the business art majors scored in the opposite direction, showing greater preference for symmetrical and more-complex patterns than fine art majors and even nonartists.

To summarize, the earlier analyses indicated that DJT and both scales of the VDT are reliable. Although the tests are largely distinct from each other, several (VDT, DJT, and PA-C) show a consistent although small degree of relationship with activity and interest in art. In the absence of more-definitive validation data, several possibilities remain:

1. Each of the tests overlap with a higher-order general construct associated with artistic judgment,
2. One of the tests measures primarily artistic judgment, and the other tests are largely unrelated, or
3. There is no single overall construct for artistic judgment, but only various artistic preference variables. These variables may, however, be linked to a person's suitability for various specializations within the visual arts, such as fine art versus commercial art.

Two Studies of Artists

In this report, we present two studies in which we measured characteristics of artists. In the first study, we compared the visual preferences of professional artists and nonartists to determine whether the construct validity for the artistic judgment tests in the experimental battery, as established by the analyses presented in Report II, is supported. For that purpose, we obtained the test scores of a sample of Foundation examinees whom we had analyzed previously in a study of construct validity (Technical Report 1990-4) and, after dividing them into nonartists and artists, compared them with a sample of professional artists. This sample of professional artists who actively exhibited their artwork and were

recognized by their peers, and were distributed geographically across wide regions of the U.S., in this study were investigated as exemplars of professional artists. Because of the acclaim they have received as professional artists, we assume that to some extent they possess the visual abilities needed to produce works of art.

In Study Two, we examined artists in terms of the aptitudes in the standard Foundation battery plus the interests measured by the COPS interest scales. For this study, examinees who met explicit criteria (described below) that identified them as having background in the field of visual art were compared with nonartists on the Foundation battery and the COPS scales.

Some of the issues and questions that we hold as central in these studies are:

1. How do artists and nonartists differ? We expect them to differ in their visual preferences, specifically in their scores on the artistic judgment battery. Our comparison of their scores on the standard battery and the occupational interest scales could provide evidence for other differences.

2. Do the internal-structural characteristics of the tests in the artistic judgment battery differ for artists, namely, do the reliabilities of the tests and their interitem correlations differ significantly for artists and nonartists?

3. What are the implications of these studies for our understanding of the relationships between principles of visual design and persons' reactions to visual artwork?

Expected findings. We expect these studies to provide additional support for the construct validity of these tests that we reported in *Artistic Judgment II: Construct Validation* (Technical Report 1990-4). Therefore, we expect that artists and nonartists will show significant differences in their scores on the experimental artistic judgment battery.

In view of the results we reported in *Artistic Judgment II*, we expect artists to show significantly higher scores on tests in the Foundation battery measuring spatial ability and visual memory, as well as higher scores on a measure of English vocabulary. Similarly their scores on the COPS interest inventory should show significantly higher scores for occupations that are art-related.

Our expectations for the internal structure of these tests when they measure the preferences of artists are less clear. According to our review of the research literature, no systematic comparison of internal-structure properties for artists and nonartists has previously been made, and thus we are limited to speculation and conjecture. Conventional wisdom would suggest that the independence of judgment and diversity of opinion commonly attributed to artists should lead to

item and test characteristics for them that are not very stable. Artists should show greater dispersion in their scores, showing the diversity of their opinions, and less consistency in item responses (reliability) for individual artists when compared to nonartists. We expect to address this question empirically.

STUDY ONE

The following sections describe the method that we used to compare the visual preferences of professional artists, examinee artists, and nonartists. The results of our comparisons then follow.

Method

Samples

Nonartists. The nonartists in this study were clients of the Foundation's aptitude-testing service, who paid a fee to receive aptitude evaluation, generally for educational and occupational planning. They were classified as nonartists because their responses to an artistic background questionnaire indicated that they had had either little or no formal art training or no experience in an art-related occupation or both. After giving consent, they completed, along with the standard Foundation battery, a set of experimental artistic judgment tests.

A total of 1,578 nonartists completed one or more of the tests in the artistic judgment battery. Of the nonartists, 53.4% were male and 46.6% were female. Their ages ranged from 14 to 68 years with an average of 25.8 (SD = 10.1). The median age was 22 years, indicating a moderate skewing in the direction of greater age. Racially and economically, the nonartists tended to be white and middle to upper-middle income. Most of them were college-educated or college-bound.

Geographically, 442 of the nonartists were tested in Foundation offices in the eastern United States (28%), 824 were tested in southern Foundation offices (52.2%), and 312 in western offices (19.8%).

Examinee artists. The examinee artists in this study, like the nonartists above, were clients of the Foundation's aptitude-testing service, who similarly paid a fee to receive aptitude evaluation, generally for educational and occupational planning. Unlike the nonartists, however, their responses to an artistic background questionnaire indicated that they possessed an art-related background that included some art training and some employment in an art-related occupation. They, like the nonartists, took the standard Foundation battery and, after giving consent, completed a set of experimental artistic judgment tests.

Of the 107 examinee artists in this study, 42.7% were male and 57.3% were female. Their age ranged from 16 to 57 years with an average of 28.4 years (*SD* = 9.0). The median age was 26 years, indicating a mild skewing in the direction of greater age. As with the nonartists, racially and economically, the examinee artists tended to be white and middle to upper-middle income, and most were college-educated or college-bound.

Geographically, 40 of the examinee artists were tested in Foundation offices in the eastern United States (37.4%), 46 were tested in southern Foundation offices (43%), and 21 in western offices (19.6%).

Professional artists. The professional artists selected for this study were from three metropolitan areas: New York City (4), New Orleans (17), and Chicago (41). All the artists were actively engaged in the design and production of visual artworks at the time of the study. In addition, they were required to satisfy at least one of the following two criteria to be included in the study: (a) having exhibited visual artwork at juried art shows or exhibitions within the previous three years and (b) having derived a portion of their personal income from art design or production. Eleven of the artists from Chicago were advanced undergraduate students at the Art Institute of Chicago at the time of their testing. Because their enrollment in this art school requires juried evaluation, both for admission to the school and to progress through the curriculum, we concluded that their background met the same criteria for inclusion as the other artists.

General characteristics of the professional artist sample.[1] Of the 62 professional artists in this study, 35.5% were male and 64.5% were female. The age of the artists ranged from 19 to 75 years with a mean of 40.9 years (*SD* = 13.1) and a median of 39 years. As with the nonartists and the examinee artists, the professional artists tended to be white, and most were college-educated.

Many of the artists (48.4%) had exhibited their artwork at juried shows within the last three years. When asked what materials they had used in their last projects, 13.3% indicated water color, 35.0% indicated ink and paper, 11.7% indicated oil and canvas, 11.7% indicated acrylic, 5.0% indicated fabric, and the remainder were miscellany. Fifty-three percent of the artists indicated that they produced two-dimensional artworks such as paintings and drawings, while 26% produced three-dimensional artworks such as sculptures and buildings. The remainder produced multidimensional artworks such as stage sets and film or video productions. Fifty percent derived all their income from their artworks, while another 30% derived a portion of their income from artworks.

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[1]Biographical descriptions of the professional artists appear in Appendix D of this report.

Of the group, 80% indicated that they had had two or more years of art training, and 77% had received their training at colleges or universities in departments specializing in art. Forty-eight percent indicated that their training was specialized in fine art, 18% indicated their specialization was commercial art, and 29% indicated a background that was both fine and commercial art, while the remainder (5%) were unclear.

In this sample of professional artists, 84% reported having been employed in an art-related field. The group averaged spending 30 hours per week on the production of artwork.

Over 80% of the artists indicated that they had received some recognition or award for their artwork, with newspaper and magazine reviews, some local and some national, the most frequent form of recognition. A majority of artists reported receiving recognition more than once. In terms of awards, as an example, an editorial illustrator in the sample had been a Pulitzer Prize finalist; an architect had been commended by the American Institute of Architecture; and one of the photographers was ranked among the top 75 photographers in the country in a competition sponsored by two commercial companies, Kodak and Nikon. Several of the artists were recipients of state grants and artist guild awards, while others were formally listed in *Who's Who in the Midwest*.

The artists generally expressed high levels of satisfaction with their work, with 70% indicating moderately high satisfaction or above. Table 1 summarizes the art backgrounds of the nonartists, artists, and professional artists.

Groups within the professional artist sample.[2] In extensive interviews of the professional artists, we found this sample could be divided into three subgroups. Our categorization is based primarily on differences we found between them in their artistic specialization and the extent of financial reward they received for their artwork. We describe this grouping of professional artists below:

1. One group consisted of 21 (35%) professional artists whom we labeled "noncommercial artists" (in lay terms, "fine" artists). All these artists exhibited their artwork at recognized galleries and shows. In all cases, permission to exhibit was juried (i.e., space in the show is awarded to artists competitively), and all the artists had received awards and many had had their work reviewed widely in newspapers and magazines. The average age for this group was 44.4 years (*SD* = 15.9), and it consisted of 6 males and 15 females. Three student artists were included in this group.

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[2]Because two artists did not complete questionnaires, they were not included in the classification of artists.

Table 1

Comparison of Backgrounds of Nonartists, Examinee Artists, and Professional Artists

	Questionnaire item	Non-artists	Examinee artists	Professional artists
Group means				
	Age (in years)	25.85	28.43	40.87
	Years of art training[a]	.53	2.27	4.35
	Years employed in art occupations[b]	.30	2.01	10.50
	No. of hours spent on art per week[c]	NA	NA	28.23
	Number of art awards received[d]	<<1.00	<1.00	1.85
Group percents[e]				
	Earned an art award	6.18	25.23	NA
	Read 2 or more art-related magazines	22.57	43.93	NA
	Completed 2 or more designs	38.09	66.36	NA
	*N*s	1,578	107	62

[a]The professional artists include 2 persons with no formal training and 11 student artists.

[b]Six professional artists had never worked in an art occupation.

[c]Information for nonartists and examinee artists not available.

[d]Forty-eight percent of the professional artists reported having received three or more awards.

[e]Information for the professional artists was not collected.

In this group, 20 artists (95.2%) indicated that they had had at least one museum show at some time in their career, and 14 (66.7%) indicated more than one. Many of these artists had received art grants and had national reputations. A characteristic that became apparent to us, concerning this group, was their relative absence of financial motivation. Eleven of them (52.3%), despite years of training and exhibition, reported receiving little or no income from their artwork, emphasizing their deep personal commitment to artistic ideals as their primary satisfaction. All of them identified the satisfaction from artistic creation as their purpose for engaging in artistic endeavors.

2. The second group, consisting of 13 (27.7%) artists, was labeled "commercial artists." They were illustrators, graphic designers, architects, and so on who shared a common feature: their visual artwork was their primary source of income. All of them had received specialized art training and were current members of professional societies. Some owned their own design companies and art galleries with an international clientele, and typically they had earned some form of professional recognition (e.g., magazine design awards, advertising agency awards, and awards from organizations such as the Society of National Publications and the American Institute of Architects) for their work. Although we did not ask for specific information concerning income, a characteristic of this group is their financial success. Their studios and offices were in expensive commercial districts, frequently in deluxe office buildings. They commonly worked on a professional staff supported by secretaries and receptionists.

Another characteristic of this group of artists that became apparent when we tried to interview them is that they are very busy. It was usually necessary to schedule special appointments during evenings and weekends to interview and test them, and these artists emphasized the need to serve their professional clientele. Times and deadlines were important to them, and all their artistic energy was focused on their commercial work. Not surprisingly, we found that, unlike the first group of artists, only one artist in this group reported participating in juried art shows or exhibits, and none of them had participated in a museum show. Our interviews indicated that these artists did not have the time for or a particular interest in exhibits or museums. Two student artists who were older and possessed the appropriate professional experience were classified in this group.

3. After classifying many of the professional artists into fine or commercial art groups, we then identified a third group. These artists earned some portion of their living from working in an artistic occupation, but they were not nearly as successful financially as the commercial art group, and these artists also presented their work at fine-art exhibits and shows. This group consisted of 26 (43.3%) artists whom we called "mixed" artists.

Frequently, these artists were employed as commercial artists and were distinguished by professional awards, but 17 (65%) also exhibited artwork in juried competitions that were independent of their professional careers. Seven of the artists (26.9%) reported having had museum shows. Our interviews, however, indicated that financial concerns prevented them from making a greater commitment to fine art. If they were employed as commercial artists, their status within their companies was consistently at a lower level than the commercial artists in the group described earlier. Few of them owned their own companies or galleries, and the ones that did worked primarily out of studios in their homes and not the large-scale graphic-arts firms that employed some of the commercial-artist group. In other words, these are artists who received awards and recognition for both their commercial and their noncommercial art. Four student artists were included in this group.

Measures

The experimental artistic judgment battery that was administered to the nonartists and the examinee artists consisted of the Design Judgment Test (DJT), the Visual Designs Test (VDT), Proportion Appraisal (PA), and the Visual Aesthetic Sensitivity Test (VAST). The professional artists completed the same artistic judgment tests plus the Barron-Welsh Art Scale.

Descriptions of the tests, their methods of scoring, their technical characteristics, and sample items follow below. The nonartists, examinee artists, and professional artists also completed questionnaires that surveyed their art backgrounds (see below).

Design Judgment Test (Graves, 1948). Published in 1948, the DJT in its standard form contains 90 items. On each item, examinees are presented with two or three visual designs printed on a page in a three-color format, with black-and-white figures against a light green background. Examinees are directed to choose the one design from each group that they most prefer, that is, that they like the most. All but one of the designs on each item are intended by the test author (Graves, 1948) to violate basic principles of aesthetic order--"unity, dominance, variety, balance, continuity, symmetry, proportion, and rhythm" (Graves, 1948, p. 2). Examinee scores consist of the number of times their preference matches the choice considered to be artistically superior, (i.e., the choice that does not violate aesthetic principles). Graves reported test reliabilities ranging from .82 to .93, based on several samples of art students (Graves, 1948). He found that third-year illustration students scored 66.2 (SD = 3.18), while first-year engineering students scored 49.6 (SD = 3.90). Eysenck (1970; Eysenck & Castle, 1971), however, failed to replicate this finding in other samples. He also performed a factor analysis of the DJT and concluded that the 90 items do not form a unidimensional scale (Eysenck, 1967). He did find a 22-item subset of the

DJT that is unidimensional, and he speculated that preferences on these 22 items may be associated with artistic judgment (Eysenck, 1972b). Visual inspection of the 22-item subset of the DJT shows that the items consistently present choices between symmetric and asymmetric designs, with the keyed choice being the asymmetric design. Figure 1 presents an item similar to those in the subset.

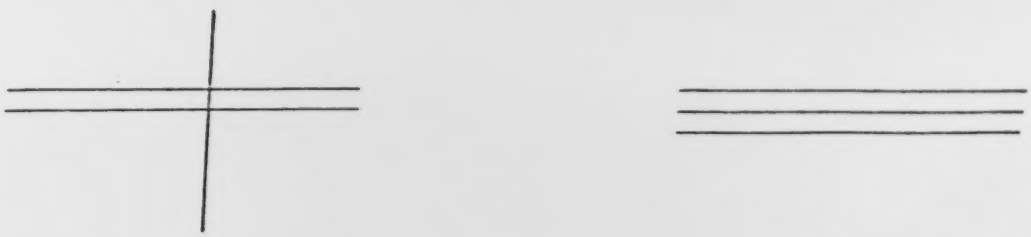
To enable us to further evaluate its psychometric properties, the 22-item subset of the DJT was administered as part of the artistic judgment battery. (Henceforth, when we refer to the Design Judgment Test [DJT], we mean the 22-item subset that was included in the experimental battery.)

In our analysis of internal structure with a lay population (namely, Foundation examinees), we found that the reliability for the 22-item subset was .89 (Technical Report 1989-2). Item-total correlations ranged from .16 to .62 with a mean of .49, and a principal components factor analysis indicated that a one-factor solution is adequate for the test. Rasch item infit values indicated that all items except Item 4 (the first item on the test) fit the model requirements for linear measurement.

In our analysis of construct validity (Technical Report 1990-4), the DJT showed significant positive relationships with several art-related criteria such as

Figure 1

Sample Item from Design Judgment Test



Examinees select the design they prefer.
The keyed choice is the design on the left.

participation in art-related activities and interest in art occupations, as well as choice of an art-related college major. Specifically, analyses of questionnaire items indicated that examinees with previous art training, previous art employment, and art hobbies and other art-related experiences tend to score higher on the DJT, while the DJT also showed positive correlations with several scales for art occupations on the high school and college forms of an interest inventory. Analyses regarding the college majors of examinees also showed that persons who major in art tend to score higher on the DJT than persons who major in other areas.

The analyses of construct validity also showed that the DJT is related to some tests in the Foundation standard battery. The DJT showed modest positive correlations with tests measuring reasoning, structural visualization, and memory for designs.

Visual Designs Test. The conceptual bases for the VDT are principles from visual perception and Gestalt psychology. In studies of perception, researchers have found that viewers organize visual stimuli into sub-units and over repeated exposures build up a percept (Haber & Hershenson, 1965) that corresponds to a verbal concept. This extraction of information from a visual image occurs instantaneously (Brighouse, 1939; Kellet, 1939; Külpe, 1903); Haber and Hershenson (1965) found that the process occurs with exposures as brief as five milliseconds, although the time necessary for forming a percept depends on the content of the image. Gestalt psychologists have argued against an elemental approach such as this to perception, although they too suggest that a viewer operates on an image by extracting its simplest structure (Koffka, 1935; Köhler, 1920). This principle of information extraction guided the development of the VDT, in which a visual image is conceptualized as consisting of a cell structure in which groups of cells function together to form patterns and designs. As a consequence, any manipulation of the cells that underlie an image changes the overall pattern, and possibly the preference for it. When one systematically constructs designs that differ in characteristics known to distinguish between artists and nonartists, these designs, when used as test items, should be effective in identifying persons with preferences similar to artists. On the basis of considerable previous research, complexity and order were the characteristics chosen for manipulation in the VDT.

This theoretical perspective was put into operation by means of a systematic design-construction program consisting of rules for the assignment of visual elements to randomly chosen locations within 8" x 11" visual fields (Technical Report 1988-1). Although programmed artwork (using in part explicitly random factors) has been developed by others (Attneave, 1956, 1957, 1959; Dorfman, 1965; Noll, 1966, 1972), researchers have not simultaneously manipulated

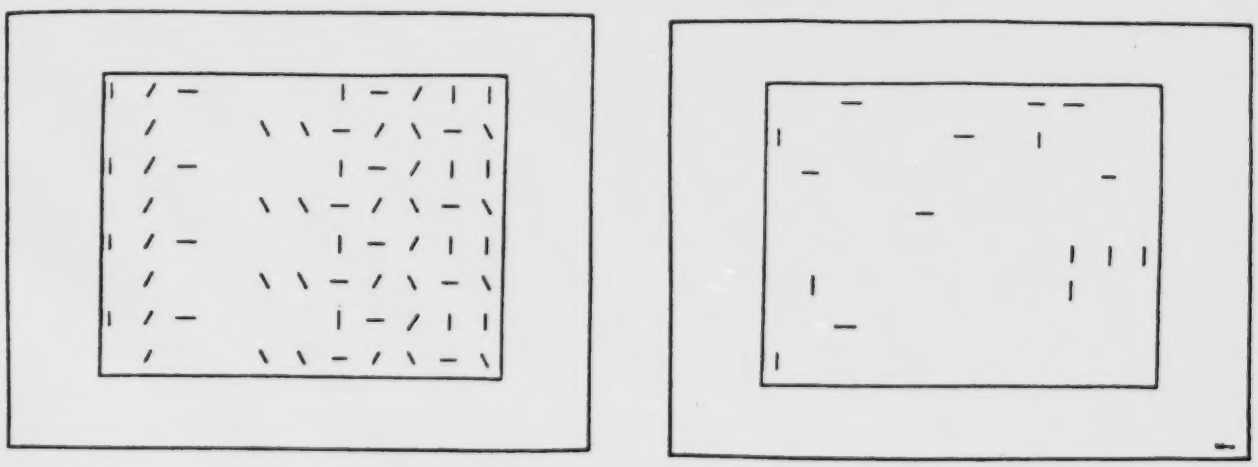
complexity and order nor used designs of this type in individual-difference measures. Figure 2 presents two visual designs used in a VDT test item.

For the VDT designs, the total number of elements assigned to a visual field (similar to Birkhoff's operational definition of complexity, i.e, the number of sides of a polygon; see Birkhoff, 1956, for a discussion) determined the approximate complexity of a design, while manipulation of the repetition of a pattern in a design by 50 or 100% controlled the order. Designs with a great deal of repetition were considered to possess a high degree of order, while the absence of repetition resulted in totally random patterns. Our manipulation of order differs from the operational definition of other researchers (Garner, 1970) because our method does not result in a symmetrical pattern or mirror image for patterns with a high degree of order. Instead we follow a model presented by Attneave (1959) in which order is operationally defined by a pattern of repetition across a design. According to Attneave, this method should produce differences in persons' liking for a pattern, and thus we expected it to be useful in distinguishing between artists and nonartists. The complete item-construction specifications are given in Technical Report 1988-1 (pp. 36-37; see also Research Memorandum 1989-3 and Bezruczko & Schroeder, 1990).

In 1987, the Foundation's Atlanta and Dallas offices presented two sets of 45 VDT designs each to their examinees. The examinees rated the attractiveness of

Figure 2

Sample Item from Visual Designs Test



Examinees select the design they prefer. The design on the left is constructed to be more complex.

each design on a scale of 1 to 5. The results indicated that greater complexity was associated with higher attractiveness ratings by these nonartists for the designs, while order had a systematic effect only in its interaction with complexity.

Following on the rating-scale results, Bezruczko formed a forced-choice test presenting 84 pairs of designs (see Research Memorandum 1989-3) that contrast higher levels of complexity with lower levels of complexity. The respective levels of order were not controlled and thus vary from item to item. Examinees are instructed to select the design from each pair that they prefer.

This forced-choice version of the VDT (henceforth referred to simply as the VDT) was administered to 1,686 unselected Foundation examinees. A factor analysis of these data (Technical Report 1989-2) indicated that the test has two major factors. The first factor (Simplicity) represents preference for simplicity over complexity in random visual designs. The second factor, Uniformity, contrasts more-ordered and -uniform designs over less-ordered designs. Both factors were reliable: .95 and .88, respectively. The analyses and results presented in this report are based on responses to this forced-choice version of the VDT.

The analyses of construct validity showed that Simplicity, the first factor of the VDT, is related significantly to art-related criteria (Technical Report 1990-4). Simplicity scores showed positive correlations with questionnaire items concerning art activities, interest in art-related occupations, and the choice of an art-related college major. The scale's associations with the tests in the standard Foundation battery are remarkably similar to the pattern for the DJT despite the low correlation between them.

Uniformity, the second factor of the VDT, did not show significant associations with art-related criteria in the analysis of construct validity.

Proportion Appraisal (Worksample 235 C). Proportion Appraisal measures differences in preferences for proportions in visual designs. In this study we used the most recent version of PA, Worksample 235 C (Technical Report 44). This test consists of 50 items, each presenting three simple geometric figures differing only in their proportions. For one figure in each item, the ratio of the width to the length is .50 (1:2); for another, .67 (2:3); and for the third, .75 (3:4). For one item (Item 50), we were unable to identify precisely the proportions. The ratio of .67 corresponds the closest of the three to the ratio of the golden section, .618[3] (see Berlyne, 1971), a favored art concept, and has tended to characterize the most-preferred figures on the test (Technical Report 99). Figure 3 presents a sample PA item.

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[3]The golden section is commonly defined as two lengths, A and B, such that A/B = B/(A + B).

PA test directions instruct the examinee to select two figures from the three presented for each item, namely, the examinees' choices for best figure and worst figure. In the past, scoring of item responses was based on the ". . . consensus of opinion of the general population. . ." (O'Connor, 1940, p. 113), or the correspondence between an examinees' responses and the most-common responses to items. According to O'Connor (1940), "The test selects men and women whose judgment of proportions conforms with that of humanity" (p. 111). This method resulted in some items with ratios of .67 as the keyed figure, while for other items .50 or .75 was the keyed choice and for other items the scoring rationale was unclear.

During previous use in the Foundation, Proportion Appraisal has been found to be moderately reliable (.70) and to correlate -.43 with the Design Judgment Test (Technical Report 792). Earlier Foundation research indicated that artists tend to score low on the test (Technical Report 792), and Foundation writers have speculated that artists tend to prefer the elongated forms on the test (ratio of .50; Trembly, 1974). This would suggest that persons who prefer more-elongated figures on PA will tend to prefer the asymmetric designs on the DJT.

Figure 3

Sample Item From Proportion Appraisal

Which figure has the BEST shape?
Which figure has the WORST shape?

In order to clarify the influence of proportions on preference, we created separate keys for .67 and consensus scoring. In the first of these scoring methods, the figure with the .67 proportions was keyed as having the best shape. Initially, examinees were given one point for each item on which they chose the .67 figure for the best. Then we gave examinees a point each time they chose the .50 figure as the worst shape (the .50 figures tended to be the most-common choices for worst shape). We refer to this method of scoring, with .67 for best shape and .50 for worst shape, as ".67" scoring.

For the second scoring method, we relied on the obtained preference responses for each item. Rather than keying the .67 figure as the best shape and .50 as the worst shape on all items, we keyed whichever figures were most often chosen on each item as the best shape and the worst shape. Thus, examinees received one point for every choice for best that matched the group choice and one point for each choice for worst shape that matched the group choice. For this scoring method, several items were not scored for best or worst because there was no clear choice (i.e., no response given by more than 40% of examinees). We refer to this scoring method as consensus scoring.

Previous validation research on PA indicated that it tends to be independent of the other tests in the Foundation battery. The highest correlations for PA reported in Technical Report 859 are .19 and .22 with Personality, which means that objective persons tend to choose the popular golden-section-like proportions, while subjective persons are more likely to prefer the more-elongated figures. As noted earlier, Foundation writers have speculated that artists also tend to prefer the elongated forms, although the documentation for empirical research on this is not available. With regard to the other artistic judgment tests in this project, PA shows little correlation with the VAST or the VDT but correlates -.28 with the DJT (Technical Report 1989-2). This indicates that persons who prefer more-elongated figures on PA tend to prefer the asymmetric designs on the DJT.

In our analysis of internal structure (Technical Report 1989-2), the average item-total correlation for each method of scoring was .24. When we examined the item responses for consensus scoring and .67 scoring with a principal components factor analysis, we determined that both have one primary factor, with some residual covariation. Alpha reliabilities for the two scoring methods were moderate (r_{tt}s = .76 and .78, respectively).

Although the Rasch infit values for PA tended to parallel the item-total correlations, with low item-total correlations corresponding to larger infit values (i.e., greater misfit), eleven of the items misfit the model when PA was scored on the basis of consensus of opinion, while none of the items misfit the measurement model when the items were scored for the .67 proportion. The difference in infit values indicates greater consistency by examinees in their order of preference

when PA is scored for the ratio .67, which is consistent with the slightly higher alpha reliability for this scoring method.

The analyses of construct validity showed Proportion Appraisal Consensus to have the weakest association of the tests in the experimental artistic judgment battery with abilities tested in the standard Foundation battery, suggesting that the preference for shapes, when scored for agreement with the consensus, is relatively independent of other mental traits (Technical Report 1990-4).

Although the relationship between Consensus scores and an artistic background questionnaire was also weak, we did find modest significant correlations between the preference for proportions that differ from the group consensus and artistic activities. The analysis of PA Consensus and the COPS interest scales also indicated that preference for proportions that differ from the consensus showed a very small positive relationship with interest in the area of Arts-Performing.

When we compared the college majors of examinees, by grouping them into fine art, business art, and non-art majors, we found that PA Consensus scores differed significantly. The examinees majoring in fine art received the lowest scores, once again indicating that visual preferences that differed from the consensus are associated with artistic interest and activity.

Construct validity analyses of PA .67 showed little association with the standard Foundation battery, no associations with items on an artistic background questionnaire, and no correlations with the COPS interest scales. When we examined the differences in the scores between college major groups, they were not significant.

Visual Aesthetic Sensitivity Test (Götz, 1981). This test presents examinees with 50 pairs of nonrepresentational designs artistically rendered by an internationally renowned painter. The test developers created the designs in each pair in such a manner that one of them is considered to have better harmony and balance, and the examinee is instructed to identify that design in each pair, as specified in the test instructions: Each pair consists of two quite similar pictures, one of which is superior from the point of view of design; *it is more harmonious, better balanced, and better adapted in the way the elements are ordered and in the way the lines are drawn* . . . . Your task will be to discover . . . which in each pair is the *better design*. (Götz, 1981, instruction sheet)

The test developer, K. O. Götz, argues that the keyed designs on the VAST are objectively "better" than their nonkeyed counterparts in terms of balance and harmony and that the test's validity is therefore independent of the styles and fashions of any particular point in time. In support of this position, he reports a

review of the designs by eight professional artists (Götz et al., 1979). For all 50 items in the published version of the test, the eight artists agreed that the keyed design was better balanced and more harmonious than the nonkeyed design.

Examinees receive one point for each item on which their choice of the better design (in terms of balance and harmony) agrees with the key. Thus, examinees' abilities to identify balance and harmony are evaluated against the standards set by the test developer. It should be noted that the other artistic judgment tests studied here, in contrast, rely on personal reports of preference and do not ask examinees to make objective judgments of value.

Visually, the VAST comprises two types of items. The first type of item contains simple concrete designs that generally appear as full shapes, oftentimes with rounded contours, although a few have sharp points. The designs in these items generally have little detail. The second group contains designs with broad sweeping brush strokes, sometimes producing an abstract circular motion. These designs are generally very complex, with an extensive amount of fine detail in the brush work. Figure 4 presents an item similar to the simple concrete type of item from the VAST.

According to Götz et al. (1979), photographic transparent slides of 42 of the 50 test items have been administered to groups of nonartist adults and found to have a reliability of .84. Our studies used a printed version of the VAST, in which the designs are reproduced as duotone (black and white) prints. Visual differences between projected slide images and two-dimensional print copy may influence the test's psychometric properties. In particular, the highly detailed features of the brush-stroked items may not be as apparent in the printed version as in the slide version, thus influencing responses.

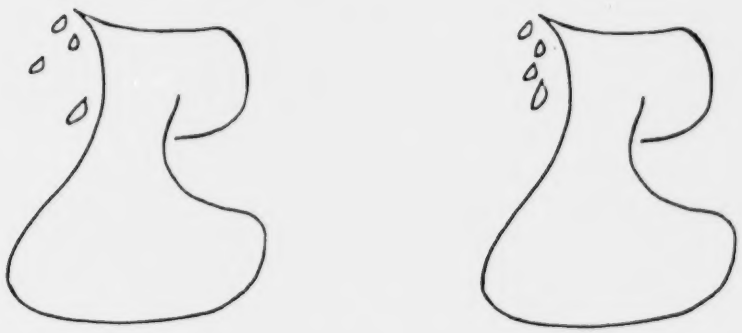
Our analysis of internal structure (Technical Report 1989-2) indicated that most of the test items in the VAST tend to be relatively easy for examinees, although *p* values for two of the items were close to the guessing level for this test. Item-total correlations were generally low, ranging from .00 to .30 with a mean of .17. In a principal components factor analysis, we found the VAST to have one primary factor with residual covariation.

The reliability of the VAST was low, .66. Based upon an analysis of item-total correlations, we formed subsets of VAST items and found a group for which the reliability would be greater than .80 for a test of 60 items. These are items that appear simple and concrete and provide a clear contrast of harmony and balance between designs.

The analyses of construct validity (Technical Report 1990-4) showed the VAST to correlate significantly with a broad range of tests in the standard

Figure 4

Item Similar to the Items on the Visual Aesthetic Sensitivity Test



The design on the right is the better of the two designs in terms of balance and harmony.

Foundation battery, indicating that the ability to identify balance and harmony in visual designs has significant relationships with a wide range of mental abilities. Its association with the battery is somewhat stronger than for any of the other tests in the experimental artistic judgment battery.

In its relationships with responses on the artistic background questionnaire, the VAST showed a significant negative correlation with attendance at museums of contemporary art, indicating that examinees who go to contemporary museums show lower ability to identify balanced and harmonious designs. The VAST did not show any correlations with the COPS interest scales.

The comparison of college major groups showed that non-art majors received the highest scores on the VAST, with business art majors scoring slightly lower. The fine art majors showed the lowest scores.

Barron-Welsh Art Scale (Welsh & Barron, 1949). We included the BWAS in this study because it has been widely used and studied previously, and its authors

claim that it manipulates the design features of symmetry and complexity (Barron & Welsh, 1952), which appear to be related to artistic judgment. Its validity as a measure of artistic judgment is of interest to the Foundation.

This test was originally derived from the Welsh Figure Preference Test, designed to detect and diagnose psychiatric abnormality (Welsh, 1949). The Welsh test consisted of 200 "ruled and free-hand figures drawn on 3 by 5 inch cards" (Barron & Welsh, 1952, p. 199). Examinees study each design and indicate whether they like or dislike it. A pilot study conducted by Barron and Welsh (1952) and replicated by Rosen (1955) indicated that artists tended to like a particular group of figures with similar visual characteristics. Barron and Welsh formed a test of preference for these figures called the Barron-Welsh Art Scale (BWAS), which in its revised version (Welsh, 1959) consists of 86 items, of which 60 are scored. According to the key for the test, 30 of the designs are liked by artists, and 30 are disliked, and an examinee receives a point for each agreement with the key. An interesting aspect of the test is that all the items that are scored for dislike are very simple concrete figures that are centered symmetrically in the viewing field. The items that are scored for like tend to be abstract and expressive without any particular emphasis on symmetrical layout. The scale has high reliability, .96 (Barron & Welsh, 1952), and researchers have found it to be related to several art-related criteria.

Subsequent studies have shown the BWAS to correlate with tests purporting to measure artistic creativity (Barron, 1963; Cashdan & Welsh, 1966; Lang & Ryba 1976), indices of originality in art and non-art areas (Gough, 1961; Rosen, 1955), and a questionnaire measure of creativity motivation (Golann, 1962). Child (1964, 1965) reported significant positive correlations between BWAS and a test of aesthetic judgment, which is consistent with the relationships found between the Design Judgment Test and the Meier Art Test (Carroll, 1933). Studies with children, however, have not supported the validity of the BWAS as a measure of artistic judgment (McWhinnie, 1969; Schaefer, 1968; Ward, 1968), suggesting a developmental threshold for the valid use of the test.

The general support that empirical studies have shown for a relationship between the BWAS and art-related criteria, however, has not led to a consensus concerning the specific aspects of the figures that influence preference. While Barron and Welsh (1952) described these figures as differing in their symmetry and complexity and Barron attributes differences in scores to a complexity-simplicity dimension (1953), other researchers generally do not support this interpretation (Eysenck & Castle, 1970a; Moyles, Tuddenham, & Block, 1965; Rump, 1968; Rump, 1977). They note that the figures in the test confound several aspects of complexity and symmetry in their construction, and thus the respective influence of these factors on preference is inconclusive. Getzels and Csikszentmihalyi (1969) suggested that these figures contrast concrete versus abstract art.

In a principal components analysis, Eysenck and Castle (1970a) failed to find empirical support for a simplicity-complexity interpretation, showing that preferences for the figures define four unrelated, almost entirely independent factors. They did find their Factor 1 to consist chiefly of geometrical designs that they suggested were similar to a factor that Eysenck had described previously (Eysenck, 1968; Eysenck & Castle, 1970b) as the preference for simplicity. What the earlier studies failed to note, however, was that in Eysenck's studies, artists were found to prefer polygons that were less complex, while all the items on Factor 1 of the BWAS are keyed for their dislike by artists. Consequently, this research did not establish definitively the association between the complexity of an image and artistic judgment.

Because of the BWAS's lack of unidimensionality, Eysenck and Castle recommended developing four separate scales for the test and examining their validities. To our knowledge, no reported studies have done this. Figure 5 shows two figures similar to the items in the Barron-Welsh Art Scale.

Artistic background questionnaires. The 107 examinee artists and 1,578 nonartists in this study completed a questionnaire describing their training and experience in the visual arts. A copy of the questionnaire appears in Figure 6. The questions include both closed-ended parts to facilitate data analysis and open-ended parts that allow respondents to elaborate on their artistic experiences. The coding system for the open-ended questionnaire items, designed by Bezruczko, appears in Appendix A.

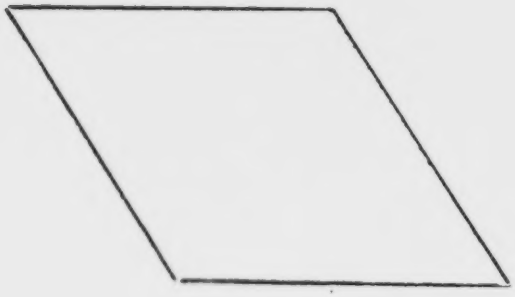
The professional artists completed a questionnaire similar to the one described above that appears in Figure 7. In addition, the professional artists participated in debriefing interviews conducted by Bezruczko and Faucheux to clarify or elaborate on their responses to particular questions.

Procedures

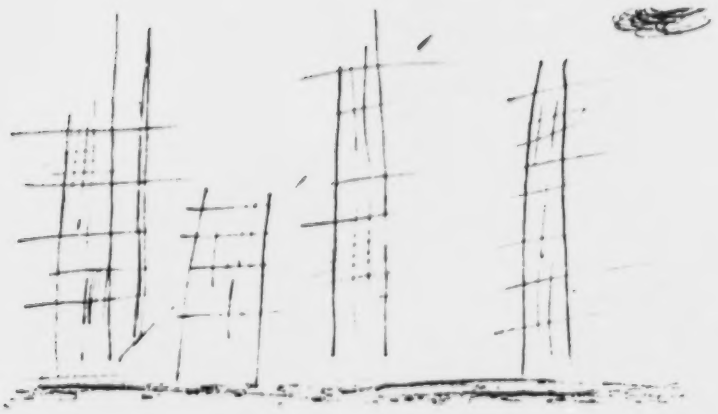
As noted previously, all testing of the nonartists and examinee artists was conducted at Foundation offices by trained test administrators. Foundation examinees take a total of five 90-minute sets of tests. Oral instructions precede all the tests. Two sets of tests are administered individually, and three are group administered using taped and written instructions. The artistic judgment tests were administered by means of written instructions at the end of sessions of tests from the standard battery. The tests were administered in this order: VDT, DJT, PA, VAST. In all cases, any tests started in one session were completed in that session. None of the tests was timed, and the standard directions for administration were used. The items were presented in booklets, and examinees marked their responses on separate answer sheets.

Figure 5

Items Similar to the Items on the Barron-Welsh Art Scale



Items like this load on Factor 1 and are keyed for disliking.



Items like this load on Factor 2 and are keyed for liking.

Figure 6

Artistic Background Questionnaire for the Foundation Examinees

VOCATIONAL/AVOCATIONAL ACTIVITIES QUESTIONNAIRE

Name _____

Folder #-Lab # _____

A number of the following questions concern the visual arts. The visual arts are endeavors involving primarily the visual form and beauty of objects or groups of objects. The visual arts include painting, sculpture, and photography and are related to such occupations as interior decoration, architecture, fashion design, graphic arts, and landscaping.

1. Please list your occupation: _____

   Describe your work: _____

2. Have you had any formal training in the visual arts? ___ yes ___ no

   If yes, how many years of training? _____

   Describe your training: _____

3. Do you or have you worked in a (visual) artistic or aesthetically-related occupation? ___ yes ___ no

   If yes, for how many years? _____

   Describe this work _____

4. Do you engage in volunteer work or hobbies involving visual art (excluding everyday activities such as buying clothes)? ___ yes ___ no

   If yes, describe: _____

5. Have you ever won awards for your (visual) art? ___ yes ___ no

   If yes, describe _____

Now please complete the questions on the other side of this page

Questionnaire - p 2

6. As far as you know, do you dream in color or black and white?

   ___ color ___ black and white ___ do not know

7. How often do you visit art museums or galleries featuring contemporary art? _____ times per year

8. How often do you visit art museums or galleries featuring classical art? _____ times per year

9. Check which of the following magazines that you read on a regular basis

___ Art in America	___ Art & Antiques
___ Art Forum	___ Connoisseur
___ Art News	___ Flash Art
___ Photography	___ Popular Photography
___ American Photography	___ Modern Photography
___ Architectural Digest	___ Vogue

   ___ Other magazines that emphasize visual art

   Please list _____

10. Check the areas in which you have developed a pattern or design that was used in completing a project

___ Furniture	___ Ceramics	___ Interior decorating
___ Landscaping	___ Home remodeling	___ Floral arranging
___ Fashion		

    If you checked any of these areas please describe

11. Are there any other activities (excluding everyday tasks) involving visual art that you engage in that were not covered by this questionnaire?

    ___ yes ___ no

    If yes, describe _____

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Figure 7

Artistic Background Questionnaire for the Professional Artists

ARTISTIC BACKGROUND QUESTIONNAIRE

Name _____

I.D. _____

1. Have you had any formal training in the visual arts? ___ yes ___ no
   If yes, how many years of training? _____

   Describe your training: _____

   _____

2. In what kind of visual art do you engage? Please specify whether you concentrate on painting, drawing, sculpture, crafts, photography, etc.

   _____

3. What materials did you use in the visual art project that you completed last? Specify whether it was oil, acrylic, paper, cloth, wood, etc.

   _____

4. Have you held an organized exhibit of your art work within the last three years? ___ yes ___ no If yes, how many times? _____

   How many were juried exhibits? _____

   Have you ever held a museum show? ___ yes ___ no
   If yes, how many times? _____

5. Have you received recognition (newspaper reviews, awards, etc) for your art? ___ yes ___ no

   If yes, describe: _____

   _____

6. How many hours a week do you spend on art? _____

7. Do you or have you ever worked in a (visual) artistic or aesthetically-related occupation? ___ yes ___ no If yes, for how many years? _____

   Describe this work. _____

   _____

Now please complete the questions on the other side of this page

Questionnaire - p. 2

Does the work in question 7 require you to lay out or plan new projects? Check one of the following.

Not at all ___	Not very much ___	Some of the time ___	Most of the time ___

Does this work require you to complete projects developed and directed by another person, such as a designer? Check one of the following.

Not at all ___	Not very much ___	Some of the time ___	Most of the time ___

How would you rate your job satisfaction in this artistic occupation? Check one of the following.

Low ___	Medium ___	Moderately High ___	Very high ___

8. What percent of your income comes from your art occupation? _____

9. If you do not work in an art related field, what is your current occupation?

   _____

   Describe your work. _____

10. Which kind of art do you prefer?

    ___ abstract ___ realistic ___ no preference

11. Please indicate how many times a year you visit
    a. a museum of classical art _____. b a museum of contemporary art _____.
    c. special shows _ _____.

12. As far as you know, do you dream in color or black and white?
    ___ color ___ black and white ___ do not know

13. Check which of the following magazines you read on a regular basis.

___ Art in America	___ Art & Antiques	___ American Photography
___ Art Forum	___ Connoisseur	___ Architectural Digest
___ Art News	___ Flash Art	___ Popular Photography
___ Photography	___ Vogue	___ Modern Photography

___ List other magazines that emphasize visual art, that you read:

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The procedures for testing the professional artist sample differed somewhat from those for the nonartists and examinee artists. First, all testing was conducted by Bezruczko and Linda Faucheux, from the Foundation's New Orleans testing office. They administered the artistic judgment battery to the artists in sessions scheduled at a Foundation testing office or at the artist's home or studio, at the convenience of the artist, but only the experimental battery was administered--the Foundation battery and the COPS interest test were not administered.

The tests were bound in booklets, and the artists marked their responses on separate answer sheets. The tests were administered in one sitting in the following order: VAST, DJT, VDT, PA. Unlike the nonartists and examinee artists, the professional artists were also administered the BWAS. The artists followed the standard directions for the tests, which were all untimed. After completing the tests, the artists filled in the questionnaire.

During the testing, the professional artists were encouraged to comment on any particularly strong reactions they experienced when viewing the designs and images in the respective tests. As noted earlier, following the testing session a debriefing was conducted of each professional artist. During this session, their comments during the testing were explored in detail, and the artists were offered an opportunity to provide any summary comments on the testing session.

Analyses

In this technical report, Study One consists of several comparisons among the nonartists, examinee artists, and professional artists on the experimental artistic judgment battery with regard to differences in: (a) their mean test scores, (b) their intertest correlations, and (c) the internal-structure properties for the tests in the artistic judgment battery. These analyses are discussed briefly below.

The BWAS was not administered to the nonartists or examinee artists. With one exception, the analysis of intertest correlations, the BWAS is not included in subsequent comparisons in this report. We report our results concerning its internal structure with the sample of professional artists in Appendix C.

Comparison of artistic judgment test scores. The analysis of primary interest in this study is the comparison of the artistic judgment test scores among the professional artists, examinee artists, and nonartists. Because we found that scores on these tests are significantly related to age and sex (see Technical Report 1989-2), as well as education and family background, we performed an analysis of covariance controlling for age, sex, years of education, and parents' years of education. In order to support the validity of these tests as measures of artistic judgment, scores of artists and nonartists were expected to differ significantly. To facilitate the interpretation of significant differences between groups, we computed

a standardized effect size for each test by taking the difference between the highest and lowest groups after adjusting for covariates and dividing by the overall standard deviation.

Discriminant analysis. In a further comparison of the scores of artists and nonartists, we performed a series of discriminant analyses on the data. A discriminant analysis is a statistical technique that derives a linear combination of a set of variables (a "discriminant function") that provides maximum separation (discrimination) between two or more groups. In this case, we performed our first discriminant analysis using all six artistic judgment scales to discriminate between the nonartist and the professional-artist groups (the examinee artists were omitted to make the contrast clearer). The analysis yielded the optimal discriminant function for the six scales and produced a 2 x 2 classification table showing, for a given cutoff score on the function, the actual and predicted statuses of the artists and nonartists. After the first discriminant analysis, we performed additional analyses using only the DJT and the two VDT scales and then only the DJT.

Comparisons of internal structure. The internal-structure characteristics for the tests in the artistic judgment battery, when compared between artists and nonartists, indicate the extent to which the items are internally stable across these populations. Thus they indicate whether comparisons between groups are valid with a particular test. For this purpose, we provide descriptive statistics for these tests when administered to professional artists and compare the results to the item and test characteristics we reported in a study of nonartists (see Technical Report 1989-2). The analyses of internal structure also included a comparison of alpha reliabilities and item-total correlations for professional artists and nonartists.

Comparison of intertest correlations. An analysis with important theoretical implications is the analysis of the correlations among the artistic judgment tests. The results should address questions concerning the relationships between the tests in the experimental battery and their association with an underlying preference factor that could perhaps be called artistic judgment.

Analysis of the Barron-Welsh Art Scale. Outside of Eysenck's study described above, few empirical studies have been reported on the BWAS, and yet researchers frequently rely on it as a measure of artistic judgment. Thus we undertook an analysis of it, including an examination of its internal-structure properties and alpha reliability for the sample of professional artists. Because of the small size of the sample, we did not estimate logistic difficulty parameters, but we did compute values for a Rasch fit statistic. We concluded our analysis with a study of its factor structure, and we report the results in Appendix C.

Results[4]

Comparison of Artistic Judgment Scores

Table 2 shows the differences in artistic judgment scores among the nonartists, examinee artists, and professional artists. All the tests show significant differences. The largest effect sizes between extreme groups after controlling for covariates are for the VAST, .87 standard deviation units ($p < .001$) and the DJT, .86 standard deviation units ($p < .001$). The smallest magnitude of difference between extreme groups was for PA Consensus, .38 ($p < .05$). The remaining tests show effect sizes of .44 standard deviation units ($p < .001$) for VDT Simplicity, .48 units ($p < .05$) for Uniformity, and .52 units ($p = .001$) for PA .67.

The results show that the professional artists scored higher on the DJT and VDT Simplicity than the examinee artists or nonartists, and thus they showed greater preference for asymmetrical designs when compared with symmetrical ones, and greater preference for less-complex random designs when compared with those of greater complexity. The professional artists also scored lower on VDT Uniformity, PA Consensus, PA .67, and the VAST, indicating less preference for: (a) uniform, ordered designs, (b) shapes that are keyed for their agreement with a consensus for proportions, (c) shapes that are keyed for the proportion .67, and (d) designs that were keyed for their balance and harmony.

The results also show that the professional artists and nonartists did not differ significantly in the variability of their scores on the Simplicity and Uniformity scales of the VDT. On the DJT, however, the professional artists were significantly less variable than the nonartists (*SD*s = 4.23 and 5.90, respectively; $F = 1.94$; $p < .01$), while the professional artists were more variable on PA Consensus (*SD*s = 11.45 and 9.02; $F = 1.61$; $p < .01$), PA .67 (*SD*s = 11.50 and 8.97; $F = 1.65$; $p < .01$), and the VAST (*SD*s = 6.17 and 4.63; $F = 1.77$, $p < .001$).

These results are similar to but stronger than the pattern that we found in our comparison of college majors, reported in Technical Report 1990-4. The professional artists in this study, therefore, show that the differences in scores that we obtained before are more clearly differentiated for persons who have undertaken a career in art.

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[4]Before including the art students in this study, we compared their artistic judgment scores with the scores of the remainder of the professional artist sample. No significant differences were found for any of the artistic judgment tests, and we included the art students in the sample of professional artists.

Table 2

Analysis of Covariance of Artistic Judgment Tests by Artist Status

Artistic judgment tests[a]	Means (unadjusted)			*SD*[b]	Effect size[c]	*F*	*p*
	Non-artists	Examinee artists	Professional artists				
Design Judgment Test	10.62	13.67	15.63	5.91	.86	28.16	<.001
VDT Simplicity	11.72	15.70	19.07	9.67	.44	10.41	<.001
VDT Uniformity	7.43	7.84	6.10	4.08	.48	6.09	<.05
PA Consensus	38.85	38.47	36.07	9.09	.38	3.91	<.05
PA .67	36.62	37.13	33.16	9.08	.52	6.55	.001
VAST	40.13	39.60	35.81	4.76	.87	22.38	<.001
Ns	1386-1550	96-107	55-62				

Note. For each analysis, sex, age, age-squared, age-cubed, years of education, education of father, and education of mother were used as covariates.

[a]Notation for tests: VDT Simplicity (Visual Designs Test: Simplicity scale); VDT Uniformity (Visual Designs Test: Uniformity scale); PA Consensus (Proportion Appraisal: Consensus scoring); PA .67 (Proportion Appraisal: .67 scoring); VAST (Visual Aesthetic Sensitivity Test).

[b]The standard deviation of the overall sample, including the nonartists, examinee artists, and professional artists.

[c]Difference between the highest and lowest groups after adjusting for covariates and dividing by the standard deviation of the overall sample.

Discriminant Analysis

To evaluate how well the artistic judgment tests as a group distinguish between artists and nonartists, we performed a series of discriminant analyses. As noted earlier, a discriminant analysis derives, for a given set of tests, a linear combination of those tests (a discriminant function) that provides maximum discrimination between groups. To obtain the clearest solution here, we used only the nonartist and professional-artist groups.

Table 3 shows the results of three analyses. In the first discriminant analysis, all six artistic judgment scales were used. The analysis identified the following function as providing maximal discrimination: (.46*DJT) + (.48*VDT Sim) - (.21*VDT Uni) + (.28*PA Con) - (.30*PA .67) - (.58*VAST).[5] Each of the scales made a contribution to the discrimination between groups, although the contribution of some scales was rather small. The correlations of each scale with the function are shown in Table 3.

A discriminant function can be used to divide samples of examinees into those predicted to be artists (or, more properly, predicted to be similar to artists) and those predicted to be (similar to) nonartists. Table 4 shows the 2 x 2 classification table that is produced when one applies a particular cutoff score to the function derived in the first analysis, relative to the professional artists and nonartists. As can be seen, for this cutoff score, 77.8% of the professional artists are identified as artists, and 24.4% of the Foundation sample are classified as being similar to artists.

As noted earlier, some of the scales made rather modest contributions to the discrimination between the artists and the Foundation group. In earlier analyses the two Proportion Appraisal scales showed relatively small differences between artists and nonartists and substandard reliabilities (.76 and .78). Also, although the VAST showed a substantial difference between artists and nonartists, the difference was in the opposite direction from expectation--that is, artists were less likely than nonartists to identify the designs that were intended to have greater balance and harmony. Until this finding is adequately explained, we cannot recommend use of the VAST to provide vocational guidance regarding artistic fields.

In view of these considerations, we performed another discriminant analysis with only the DJT and the two VDT scales. The results are shown in Tables 3 and 4. As can be seen, these three scales alone classify correctly 79.3% of the

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[5]These coefficients are for test scores that have been standardized.

artists, while classifying 29.1% of the Foundation sample as being similar to artists. (Note: The higher "hit" rate for the three-scale analysis compared to the six-scale analysis is due to the more-generous cutoff score used in the three-scale analysis, in which 4.7% more Foundation examinees were classified as being like artists.)

We performed two additional analyses for comparison. In the first analysis, we used only the DJT score as the predictor and selected the 70th percentile of the Foundation group as the cutoff score. (The Foundation's testing program currently identifies scores at or above the 70th as "high" scores on its aptitude tests.) As shown in Table 4, the DJT alone performs somewhat more poorly than the DJT in combination with the two VDT scales, with only 53.3% of the professional artists scoring above the cutoff score.

In our final analysis, we examined the performance of the DJT plus VDT Simplicity and Uniformity in the manner in which they would likely be used in the Foundation's testing program. We set the cutoff score at the 70th percentile. To simplify calculations, we made the coefficients for the three scales whole numbers, namely +1 for the DJT and Simplicity and -1 for Uniformity. Previous research has indicated that "unit" weights of this type generally predict relevant criteria at least as well or better than more-specific weights, when both are determined by multivariate analyses (Cohen, 1990). The reason for this is believed to be that the specific weights are overly influenced by chance variation in the sample on which they are derived.

In any event, the results are shown in the last subtable in Table 4. The unit-weighted function correlated .99 with the discriminant function derived for the three scales. Consequently, the two-way classification table for the unit-weighted scores agrees almost perfectly with the table for the discriminant function, with only .2% more Foundation examinees being classified as similar to artists. Thus, it appears that the computationally easier unit-weighted function is just as effective as the function derived by the discriminant analysis.

In summary, the discriminant analyses indicate that the artistic judgment scales in combination can effectively identify persons with visual preferences similar to artists. Specifically, the results support the use of the DJT in combination with the two VDT scales. Adding Proportion Appraisal to the function would require additional examinee time with little gain in the strength of prediction. Eliminating Uniformity, the weakest of the three scales we recommend, would worsen the prediction with little gain in examinee time (Uniformity consists of only 13 items) and also eliminate the possibility of distinguishing between examinees who have a general preference for low levels of complexity (high Simplicity score, high Uniformity score) and those whose have the selective preference exhibited by the professional artists (high Simplicity but low Uniformity).

Table 3

Discriminant Analysis of Artistic Judgment Scales for Artists and Nonartists

	Six-scale analysis[a]		Three-scale analysis[b]		One-scale analysis[c]	
	Std-ized fcn coef[d]	Corr w/ fcn[e]	Std-ized fcn coef	Corr w/ fcn	Std-ized fcn coef	Corr w/ fcn
DJT	.46	.64	.55	.80	1.00	1.00
VDT Sim	.48	.56	.64	.73	--	--
VDT Uni	-.21	-.26	-.32	-.31	--	--
PA Con	.28	-.22	--	--	--	--
PA .67	-.30	-.28	--	--	--	--
VAST	-.58	-.62	--	--	--	--

Note. The two groups in the analysis consisted of 1,578 Foundation examinees who were not artists and 62 professional artists.

[a]The scales used in this analysis were the Design Judgment Test, the Simplicity and Uniformity scales from the Visual Designs Test, the Consensus and .67 scales from Proportion Appraisal, and the Visual Aesthetic Sensitivity Test.

[b]The scales used in this analysis were the Design Judgment Test and the Simplicity and Uniformity scales from the Visual Designs Test.

[c]The scale used in this analysis was the Design Judgment Test.

[d]These values are the coefficients for the discriminant function expressed in standardized form (i.e., the values after the scores on each test have been standardized).

[e]These values are the pooled within-groups correlations of the scales with the linear combination of scales (discriminant function) derived in the analysis.

Table 4

Two-Way Classification Tables for Discriminant Analyses

Six-scale analysis:[a]

		Predicted status	
		Nonartist	Artist
Actual status	Nonartist	75.6%	24.4%
	Artist	22.2%	77.8%

Three-scale analysis:[b]

		Predicted status	
		Nonartist	Artist
Actual status	Nonartist	70.9%	29.1%
	Artist	20.7%	79.3%

One-scale analysis:[c]

		Predicted status	
		Nonartist	Artist
Actual status	Nonartist	71.6%	28.4%
	Artist	46.7%	53.3%

Three scales with unit weighting:[d]

		Predicted status	
		Nonartist	Artist
Actual status	Nonartist	70.7%	29.3%
	Artist	20.7%	79.3%

[a]The scales used in this analysis were the Design Judgment Test, the Simplicity and Uniformity scales from the Visual Designs Test, the Consensus and .67 scales from Proportion Appraisal, and the Visual Aesthetic Sensitivity Test.

[b]The scales used in this analysis were the Design Judgment Test and the Simplicity and Uniformity scales from the Visual Designs Test.

[c]The scale used in this analysis was the Design Judgment Test.

[d]The linear combination used for this subtable consisted of the Design Judgment Test score plus the VDT Simplicity score minus the VDT Uniformity score.

Comparison of Internal Structure

Design Judgment Test. When we examined the descriptive statistics for the visual preferences of the professional artists on the 22 items in the DJT, the total test scores were unimodally distributed toward the high end of the scale, ranging from a low of 7 to the test ceiling of 22 (M = 15.63, SD = 4.23, Mdn = 15.50). There was essentially no skewing in the test scores, and a ceiling effect occurred for 4 (7%) of the professional artists, with no floor effect.

When we examined the item difficulties (untransformed p values) for the DJT for the professional artists, we found that on three of the items (Items 8, 21, and 47), over 90% of the professional artists selected the asymmetrical designs, which were the keyed choices. (The designs for Items 8 and 47 contrast the same designs, i.e., a symmetrical arrangement of blocks contrasted with an asymmetrical arrangement, although the designs in Item 8 are rotated 90 degrees from the designs in Item 47.) In contrast, three DJT items (Items 4, 6, and 50) were at or near the guessing level for this test (p = .50). The hardest item on the test (p = .48) was Item 44, in which a set of uniformly arranged parallel lines is contrasted with an arrangement of lines that clashes in such a manner as to produce an effect of agitation and motion, with the latter design being the keyed choice. An interesting aspect of Item 44 is that the agitation and motion that is shown in the keyed design corresponds very closely to the agitation and motion found in the nonkeyed designs of the VDT Uniformity scale. In those items, designs showing agitation and motion are contrasted with designs showing order and uniformity, and the artists exhibited consistently greater preference than the nonartists for the designs showing less order and more motion. On the DJT Item 44, although a narrow majority of artists (52%) chose the less-uniform design, this proportion was still smaller than the proportion of nonartists choosing that design (66%).

Item-total correlations for the professional artists on the DJT ranged from .11 to .60, with a mean of .35. The two items with the lowest item-total correlations were Items 21 and 69, simple designs in black-and-white formats. The items with the highest item-total correlations (Items 6, 29, 50, 51, 61, and 72) were dissimilar in content and tended to be relatively difficult items ($p < .78$). The alpha reliability of the 22-item version of the DJT for the professional artists was lower than we expected, .80.

These results for the professional artists on the DJT show differences from the results that we reported for nonartists[6] in our earlier study of internal structure

[6]The study of internal structure reported in Technical Report 1989-2 was based on the total sample of Foundation examinees, which included both the nonartists and the examinee artists compared in Study One of this report. The examinee artists composed only 6.1% of the sample,

(Technical Report 1989-2). The nonartists showed significantly lower scores and greater variability than the professional artists (*M* = 10.81, *SD* = 5.90, *Mdn* = 11). Unlike the professional artists' scores, their scores showed moderate skewing toward the low end of the scale, and 36 (2.18%) nonartists showed a floor effect. Of the nonartists, 41 (2.48%) showed a ceiling effect. None of the items were easy for the nonartists, with over 60% of them choosing the nonkeyed designs for several items. The ordering of the items in terms of item difficulties, however, is very similar between the professional artists and nonartists. The average item-total correlation for the nonartists (.49) was higher than for the professional artists, as was the alpha reliability (.89).

Visual Designs Test. Fifty-eight professional artists responded to the two scales of the VDT, Simplicity and Uniformity. Simplicity contains 34 items and Uniformity 13 items. For these professional artists, total test scores were unimodally distributed for both scales toward the midpoints of the respective scales, with very slight skewing toward the low, or more-complex, end of Simplicity and virtually no skewing for Uniformity. Simplicity scores showed a range from 0 to 34 (*M* = 19.07, *SD* = 8.95, *Mdn* = 20), and Uniformity showed a range of 0 to 13 (*M* = 6.10, *SD* = 4.16, *Mdn* = 6). On Uniformity, a floor effect occurred for 6 (10.3%) and a ceiling effect for 4 (6.9%) of the professional artists. A floor effect on the Simplicity scale occurred for 2 (3.5%) professional artists, and a ceiling effect for 3 (5.2%).

For the professional artists, values of the item difficulties for the two VDT scales ranged from .31 to .72 for Simplicity and .41 to .74 for Uniformity. The hardest item on Simplicity was Item 1, contrasting a design of high complexity with a design of low complexity and high order. The easiest item was Item 67, which contrasts a design of high complexity and high order with a design of lower complexity and moderate order.

On the Uniformity scale, the easiest item for professional artists was Item 37, which contrasts a uniform and ordered design that shows a moderate level of complexity with a design that shows a moderate level of complexity and a low level of order. The hardest item was Item 5, contrasting two very simple, ordered designs, with the keyed design showing less movement than the nonkeyed design.

The item-total correlations for Simplicity, again for the professional artists, ranged from .26 to .68 with an average of .50. For Uniformity, the item-total correlations ranged from .37 to .67 with an average of .57. The alpha reliability for Simplicity was high, .93, as it was for Uniformity, .89.

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however, and the results were very similar for the nonartists alone.

In the study of nonartists (Technical Report 1989-2), the mean for Simplicity was significantly lower than for the professional artists, 11.98 (*SD* = 9.61), and the mean for Uniformity significantly higher than for the artists, 7.46 (*SD* = 4.07). While the standard deviations are generally similar, they are slightly larger on Simplicity and slightly smaller on Uniformity for the nonartists.

The easiest item on Simplicity for the nonartists was Item 67 (*p* = .60). The item contrasts a design of high complexity and order with a design of lower complexity and moderate order. An interesting characteristic of the keyed (less-complex) choice for this item is that the pattern, although randomly generated, produces a visual effect of diagonal movement from the upper left portion of the design across the viewing field to the lower right portion of the design. We believe that the overall appearance of both consistency and movement across the design influenced the preference of nonartists for it.

The easiest item on Uniformity for the nonartists was Item 57 (*p* = .73), which contrasts a simple, ordered design that is particularly unbalanced with one of moderate complexity and order.

Floor effects for the nonartists were low, less than 1% for Simplicity and 4.7% for Uniformity.

Fewer than 1% of the nonartists showed ceiling effects on Simplicity, although 10.3% showed ceiling effects on Uniformity.

Item difficulty values on the Simplicity scale for the nonartists indicated that the simpler design in each pair was consistently less-often preferred. Only three of the 34 items were answered in the keyed direction (lower complexity) by more than 50% of the nonartists. On Uniformity, however, over 50% of the nonartists chose the keyed design for 11 of the 13 items. The items for Uniformity always contrast a uniform, ordered design with one that shows movement and expression.

The item-total correlations for the nonartists ranged from .41 to .65 for Simplicity and from .41 to .71 for Uniformity, with averages of .55 and .56, respectively. Alpha reliabilities for the nonartists were .95 and .88, respectively.

Proportion Appraisal. Fifty-six professional artists completed the 40 items in the Consensus scale of Proportion Appraisal, and 55 completed the 45 items in the .67 scale. Total test scores for the professional artists ranged from 17 to 63 (*M* = 36.10, *SD* = 11.45, *Mdn* = 47) for the PA Consensus scale. Total test scores for the PA .67 scale ranged from 9 to 60 (*M* = 33.20, *SD* = 11.50, *Mdn* = 33). The scores were unimodally distributed toward the midpoint of the test for PA Consensus, with a center slightly lower for PA .67. The professional artists did not show any ceiling or floor effects.

An analysis of internal structure showed that item-total correlations ranged from -.23 to .63 for PA Consensus and from .03 to .67 for PA .67. The average item-total correlation was .33 for Consensus, as it was for .67 scoring. Several of the items for Consensus, however, showed low item-total correlations, some of them extremely so (Items 4, 7, 9, 15, and 31). Their values were: -.01, -.21, .08, -.23, and -.03. Visual inspection of the shapes did not reveal any particular pattern. Alpha reliability was .85 for the Consensus scale, and for the .67 scale, .87.

When the total test scores for the two scoring methods for Proportion Appraisal were analyzed for nonartists (Technical Report 1989-2), the distributions had slightly higher means and lower standard deviations than for the professional artists; for Consensus: M = 38.88, SD = 9.00, and Mdn = 40, and for PA .67: M = 36.66, SD = 8.97, and Mdn = 36. Neither of the scoring methods showed floor or ceiling effects for the nonartists, and all the item-total correlations were positive. The average item-total correlation for Consensus was .24, and for .67, also .24. Alpha reliabilities for Consensus and .67 scoring for the nonartists were .76 and .78, respectively.

The nonartists showed their greatest preferences for shapes with the ratio of either .75 or .67 (near-golden-section), while .50 was clearly the shape that nonartists liked the least. The professional artists also showed a preference for shapes with the .75 ratio. But unlike the nonartists, they showed a slightly stronger preference for the .50 ratio than for .67. Nonetheless, their choice for the worst shape, like the nonartists, was for the .50 ratio. Thus the professional artists differed from the nonartists in that a substantial portion of their group liked the .50 shapes, while another portion disliked the .50 shapes.

Visual Aesthetic Sensitivity Test. Total test scores for the 62 professional artists who responded to the 50 items in the VAST were unimodally distributed around a mean of 35.81 (SD = 6.17, Mdn = 36) and ranged from 11 to 47. No floor or ceiling effects occurred for the professional artists. Item difficulties for the VAST ranged from .47 to .95. Ten of the items showed p values between 50 and 60%, near the level for random guessing on these items.

The hardest item was Item 19, which shows a set of criss-crossing bars differing in their balance. The easiest items were Items 13, 35, 36, and 44, among which the first three items present simple large masses and the fourth one shows complex swirling figures. One of the items, Item 13, showed a p value greater than .95. Seven of the items had p values greater than .85.

The item-total correlations for the professional artists ranged from -.01 to .49, with an average of .22. The alpha reliability was .76.

In the study of nonartists (Technical Report 1989-2), the mean of the test was higher than for the professional artists, with less variability (M = 40.10, SD = 4.62, Mdn = 41), and a ceiling effect was observed for two persons (<1% of the group). Item difficulties for 20 of the items were equal to or greater than .85, indicating that many of the items were relatively easy. Three of the items had p values greater than .95. We found two of the items (Nos. 16 and 21), however, that were passed by only 50 to 60% of the sample. No floor effect was observed. The alpha reliability for the nonartists was low, .66.

Summary of internal-structure analyses. These results show that the professional artists tend to be more consistent in their preferences than nonartists, showing higher reliabilities on VDT Uniformity, PA Consensus, PA .67, and the VAST. Except on the DJT, the professional artists also showed higher item-total correlations on the artistic judgment tests. The greater variability that the professional artists showed in their scores when compared to the nonartists, however, indicates that individual artists differ more from the professional artists as a group than nonartists do from each other.

Comparison of Intertest Correlations

The correlations among the tests in the artistic judgment battery for the professional artists appear in Table 5. The DJT showed a positive correlation with VDT Simplicity (.34) and negative correlations with PA Consensus and PA .67 (-.61 and -.36, respectively). The DJT also correlated positively with the BWAS (.64). The BWAS also correlated negatively with PA Consensus (-.59). Although somewhat higher,[7] the correlations follow the pattern that we reported in the earlier study of nonartists (Technical Report 1989-2), in which the DJT showed a modest positive correlation with Simplicity (.30) and negative correlations with PA Consensus and PA .67: -.28 and -.09, respectively.

These results suggest that the professional artists and the nonartists do not differ greatly in the intertest correlations for the artistic judgment tests. While the intertest correlations for the professional artists tend to be somewhat higher, the artistic judgment tests still tend to identify distinct aspects of artistic judgment, with modest association with a common underlying factor for the experimental battery. The exception to this pattern is the DJT and the BWAS, which show substantial overlap with each other. This overlap is probably due to the fact that symmetry is the primary visual manipulation in the 22 DJT items, and symmetry is one of the visual features manipulated in the BWAS items.

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[7]The differences between the correlations of the DJT with PA C, PA .67, and VDT Uniformity for the professional artists and the nonartists, using Fisher's Z transformation of r, were all statistically significant ($z_{r_1-r_2}$ ranged from 1.63 to 1.99, $p < .05$ in all cases). The difference between the correlations of PA C with PA .67 was also significant ($z_{r_1-r_2} = 1.63$, $p < .05$).

Table 5

Correlations Among the Artistic Judgment Tests for the Professional Artists

Test[a]	DJT	SIM	UNI	PA C	PA .67	VAST	BWAS
Design Judgment Test		34		-61	-36		64
Visual Designs Test, Simplicity			34				
Visual Designs Test, Uniformity							
Proportion Appraisal (Consensus scoring)					88		-59
Proportion Appraisal (.67 scoring)							
Visual Aesthetic Sensitivity Test							
Barron-Welsh Art Scale							
Reliability[b]	.80	.93	.89	.85	.87	.76	.91

Note. *N*s range from 27 to 60. Leading decimals omitted. All correlations corrected for attenuation. Only correlations significant at the $p < .05$ level displayed. The correlations not corrected for attenuation are presented in Appendix E.

[a]Notation for tests: DJT (Design Judgment Test); SIM (Simplicity); UNI (Uniformity); PA C (Proportion Appraisal: Consensus scoring); PA .67 (Proportion Appraisal: .67 scoring); VAST (Visual Aesthetic Sensitivity Test); BWAS (Barron-Welsh Art Scale).

[b]Reliability coefficients are values for Cronbach's alpha calculated on this professional-artist sample.

STUDY TWO

To review, the purpose of Study One was to compare the scores of artists and nonartists on the tests in the experimental artistic judgment battery. We tested a select group of professional artists for this purpose, in addition to another group of artists from the Foundation's aptitude-testing service, not as accomplished as the professional artists but more artistically inclined than the third group, who were nonartists. The results of Study One showed that artists and nonartists differ by almost a standard deviation in their average scores on some tests. Even after the artistic judgment scores were partialled for sex, age, education of the examinees, and education of parents of the examinees, the differences were still significant and substantial.

The purpose of Study Two was to identify additional characteristics in the domains of cognitive aptitudes and occupational interests that distinguish artists from nonartists. We examined the same samples of examinee artists and nonartists described in Study One, but compared their scores on the aptitude tests in the standard Foundation battery and the Career Occupational Preference Scales (COPS, 1983).

The following sections describe the method we used to examine these differences, followed by the results. A discussion of the results of both Studies One and Two then follows.

Method

Sample

The examinee artists and nonartists in Study Two were examinees of the Foundation's aptitude-testing service, and thus they had paid a fee to receive aptitude evaluation, generally for educational and occupational planning. After giving consent, they completed, along with the standard Foundation battery, a set of experimental artistic judgment tests. The criteria for defining examinee artists were described in the Method section for Study One. Briefly, examinees who indicated that they had had art training and art-related work experience were classified as examinee artists; the remaining examinees were classified as nonartists. Racially and economically, both groups tended to be white and middle to upper-middle income, and most examinees were college-educated or college-bound. (See page 16 for detailed information concerning the examinee artists and nonartists.)

Measures

The examinee artists and nonartists took the standard Foundation aptitude battery and the Career Occupational Preference Scales. These tests are described below.

Standard Foundation aptitude battery. The standard Foundation battery consists of 19 standardized tests, developed by the Foundation to measure 18 distinct aptitudes related to occupational and educational experience. (Two tests, Wiggly Block and Paper Folding, measure the same aptitude, structural visualization.) Table 6 lists the reliabilities of these tests and the aptitudes measured by them. The other three tests in the standard battery measure other attributes related to occupational and educational performance: English Vocabulary, Mathematics Vocabulary, and reading ability. In addition, the Foundation measures eye and hand dominance for each examinee.

The validity of the aptitude tests is supported by the many years of research reported in the Foundation's technical reports (see, e.g., Technical Report 1983-2 for intertest correlations and Technical Report 1983-6 for a validation study of physicians).

Career Occupational Preference Scales. (COPS; Educational and Industrial Testing Service, 1983). The Career Occupational Preference System is a group of interest tests used for career planning and published by Educational and Industrial Testing Service. Form P (Professional-Level) of the COPS was administered to the 98 examinee artists and 1,206 nonartists who had graduated from high school at the time of their testing. This form contains interest scales that span the realm of professional occupations, from science and technology to agriculture. The scale reliabilities tend to be high, averaging about .90. Of particular interest for this study were the Arts-Performing and Arts-Design scales.

The remaining examinee artists and nonartists took the High School form of the COPS. Because of the small number of artists taking this form, we did not include it in this study.

Procedures

Foundation examinees take a total of five 90-minute sets of tests. Oral instructions precede each of the tests. Two sets of tests are administered individually, and three sets are group-administered using taped and written instructions.

Table 6

Tests in the Standard Foundation Battery

Test	Relia.	Aptitude measured
Number Checking	.96	Clerical speed and accuracy.
Color Perception	NA	Ability to perceive colors across the color spectrum.
Ideaphoria	.97	Verbal fluency, the rate of flow of ideas.
Foresight	.97	Ability to keep one's mind on a long-range goal.
Inductive Reasoning	.84	Quickness in seeing a common element among separate facts, ideas, or observations.
Analytical Reasoning	.65	Ability to arrange ideas into a logical sequence.
Number Series	.87	Ability to use numerical information to solve problems.
Wiggly Block	.73	Structural visualization, aptitude for visualizing three-dimensional forms. Measured by the ability to reconstruct three-dimensional blocks.
Paper Folding	.82	Structural visualization, measured by the ability to rotate two-dimensional surfaces through three-dimensional space.
Personality	.89	Tendency to react from a general, objective viewpoint versus reacting from a personal, subjective viewpoint. Describes how well-suited a person is for work that is highly oriented toward person contact.
Tonal Memory	.92	Ability to remember sequences of tones.
Pitch Discrimination	.80	Ability to differentiate fine differences in pitch.
Rhythm Memory	.73	Ability to remember complex rhythmic patterns.
Memory for Design	.80	Memory for straight-line patterns.
Silograms	.92	Associative memory for English words paired with nonsense syllables.
Number Memory	.82	Ability to remember several six-digit numbers simultaneously.
Observation	.62	Memory for fine visual details.
Finger Dexterity	.86	Speed and accuracy in manipulating small objects with one's fingers.
Tweezer Dexterity	.93	Speed and accuracy in handling small objects with tweezers.
English Vocabulary	.96	Knowledge of general English vocabulary.
Mathematics Vocabulary	NA	Knowledge of mathematical terms.
Reading Efficiency	.73	Speed and accuracy in reading relatively easy material.

Source for reliability coefficients: Statistical Bulletin 1988-2.

Analyses

The comparisons made in Study Two, between examinee artists and nonartists, are described below.

Analysis of the standard Foundation battery. The comparisons between examinee artists and nonartists in this study are between their scores on the 22 tests in the standard Foundation battery. Because these scores are related significantly to age and sex (see Statistical Bulletin 1990-2), we computed an analysis of covariance for each test, controlling for these factors. In order to establish the magnitude of the differences, when they were significant, we computed effect sizes, dividing the difference between the examinee artists' and the nonartists' means by the overall standard deviation.

We analyzed the data on eye and hand dominance with two two-way analyses of variance, with artist status and sex as independent variables and eye dominance and hand dominance as dependent variables.

Analysis of the COPS interest scales. The differences between examinee artists and nonartists in occupational interests were evaluated via a comparison of their scores on the COPS interest scales. We computed analyses of covariance for this purpose, controlling for the influence of sex, age, and mother's and father's years of education. The magnitude of the differences between examinee artists and nonartists, when significant, were established by computing effect sizes in which differences between groups were divided by the overall standard deviation.

Results

The comparisons between the artists and nonartists on the Foundation battery and the COPS scales are presented below.

Standard Foundation Battery

Table 7 presents the results of analyses of covariance on the test scores of the examinee artists and nonartists. The results show that the examinee artists scored significantly higher on several of the aptitude tests and that the differences approached significance for several other tests. The largest differences after controlling for covariates were on Inductive Reasoning, .30 of a standard deviation unit; Structural Visualization, .33 of a standard deviation unit; Paper Folding, .41; Memory for Design, .30; Observation, .29; and Tweezer Dexterity, .28. All of these differences were significant at the .01 level. Differences between examinee artists and nonartists approached significance for Silograms, .19 *SD*, (p = .08); Finger Dexterity, .18 (p = .09); and English Vocabulary, .16 (p = .052).

Table 7

Analysis of Covariance of Battery Tests by Artist Status

Test	Means (unadjusted) Non-artists	Means (unadjusted) Examinee artists	*SD*[a]	Effect size[b]	*F*	*p*
Number Checking	149.00	147.95	28.99	.17	2.48	.12
Color Perception	13.18	13.32	2.29	.02	<.01	.95
Ideaphoria	276.89	292.42	66.94	.06	.34	.56
Foresight	46.44	50.49	18.52	.06	.32	.57
Inductive Reasoning	142.88	151.00	22.57	.30	7.87	<.01
Analytical Reasoning	32.17	34.13	6.91	.16	2.41	.12
Number Series	22.98	23.91	4.70	.13	1.49	.22
Structural Visualization[c]	390.21	399.95	32.14	.33	9.45	<.01
Wiggly Block	252.07	267.76	100.51	.17	2.64	.10
Paper Folding	20.07	24.65	13.64	.41	14.44	<.001
Personality	16.52	16.18	7.96	.11	1.01	.32
Tonal Memory	56.06	59.07	14.01	.07	.42	.52
Pitch Discrimination	62.91	64.50	9.92	.13	1.37	.24
Rhythm Memory	45.98	46.45	5.25	.03	.09	.76
Memory for Design	79.02	85.84	26.38	.30	7.95	<.01
Silograms	19.30	21.67	9.56	.19	3.10	.08
Number Memory	81.36	83.18	28.11	.07	.33	.57
Observation	66.88	70.20	11.73	.29	6.99	<.01
Finger Dexterity	75.54	79.39	11.64	.18	2.94	.09
Tweezer Dexterity	40.99	48.72	18.62	.28	6.76	.01
English Vocabulary	142.50	160.94	37.55	.16	3.77	.05
Math. Vocabulary	26.16	26.59	7.73	.13	.76	.38
Reading Efficiency	24.15	26.06	6.32	.07	.45	.50
Ns	1255-1265	86-88				

Note. For each analysis, sex, age, age-squared, age-cubed, years of education, education of father, and education of mother were used as covariates.

[a]The standard deviation of the combined sample, including the nonartists and the examinee artists.

[b]Difference between group means after adjusting for covariates and dividing by the standard deviation of the combined sample.

[c]Structural Visualization is the sum of the normalized scores for Wiggly Block and Paper Folding.

Next we compared the results from this analysis of the Foundation battery with the relationships that we reported previously in an investigation of construct validity of these artistic judgment tests (Technical Report 1990-4). In that study we found that scores on several of the artistic judgment tests in the experimental battery correlated significantly with a broad range of cognitive aptitudes including reasoning ability, spatial ability, visual memory, and English vocabulary, and the results in this study suggest some specific linkage between Inductive Reasoning, structural visualization, visual memory, and artist status. In this study of artists, the results did not show significant relationships between Ideaphoria, Analytical Reasoning, and Pitch Discrimination, aptitudes that correlated significantly with one or more of the artistic judgment tests in the earlier study. These results also fail to show a relationship between English vocabulary and artist status, in spite of the intertest correlations in the earlier study. The present comparison of examinee artists and nonartists, however, identified a relationship between Tweezer Dexterity and artist status that was not foreshadowed in the earlier study.

Our analysis of laterality showed that the examinee artists and the nonartists did not differ significantly in their eyedness or handedness.

COPS Interest Scales

The differences between examinee artists and nonartists on the COPS interest scales are presented in Table 8. As expected, the examinee artists reported higher interest in occupations in the areas of Arts-Performing and Arts-Design, differing from nonartists by .24 *SD* ($p < .05$) and .72 *SD* ($p < .001$), respectively. This result is similar to the pattern of correlations we reported in the study of construct validity (Technical Report 1990-4), in which scores on the DJT, VDT Simplicity, and PA Consensus also showed significant relationships with these scales.

In addition to the art-related interest scales, the examinee artists also showed trends toward greater interest than nonartists in occupations related to Technology-Civil, differing by .19 *SD* ($p = .08$), and Communication-Written, .18 *SD* ($p = .10$).

Furthermore, the examinee artists exhibited less interest than nonartists in Science-Medical-Life occupations, differing by .39 *SD* ($p < .001$); Business-*Finance occupations, differing by .44 SD* ($p < .001$); and occupations related to Computation, differing by .31 *SD* ($p < .01$).

Table 8

Analysis of Covariance of COPS Interest Scales by Artist Status

COPS scales[a]	Means (unadjusted) Non-artists	Means (unadjusted) Examinee artists	*SD*[b]	Effect size[c]	*F*	*p*
Science-Medical-Life	11.94	9.00	8.13	.39	12.27	<.001
Science-Physical	14.39	14.80	6.84	.01	.01	.93
Technology-Electrical	11.31	10.89	7.76	.02	.05	.83
Technology-Mechanical	14.87	15.05	7.75	.13	1.59	.21
Technology-Civil	13.53	14.20	7.64	.19	3.04	.08
Outdoor-Nature	19.20	19.56	7.65	.08	.49	.48
Outdoor-Agribusiness	11.86	11.23	7.98	.08	.46	.50
Business-Finance	14.28	11.00	8.27	.44	13.80	<.001
Business-Management	19.80	21.37	7.50	.09	.60	.44
Computation	10.82	9.01	7.72	.31	7.10	<.01
Communication-Written	16.34	19.12	8.33	.18	2.65	.10
Communication-Oral	16.11	16.85	8.04	.10	.76	.38
Arts-Performing	17.00	20.12	9.27	.24	4.57	<.05
Arts-Design	16.79	23.24	7.92	.72	40.59	<.001
Service-Instructional	16.29	17.41	6.92	.10	.79	.37
Service-Social	16.08	16.02	8.09	.06	.25	.61
Ns	973	80				

Note. For each analysis sex, age, age-squared and age-cubed were used as covariates.

[a]Scales from the Career Occupational Preference System Interest Inventory, Form P.

[b]The standard deviation of the combined sample, including the nonartists and the examinee artists.

[c]Difference between group means after adjusting for covariates and dividing by the standard deviation of the combined samples.

DISCUSSION

General Review of the Artistic Judgment Project

Purpose and Goals

This technical report on professional artist validation concludes an investigation into testing and measurement in the area of artistic judgment. Because of the Foundation's interest in understanding artistic judgment, as well as the need for an effective artistic judgment test in the Foundation battery, the following questions have been addressed:

1. What are the contemporary issues involved in testing artistic judgment?

2. To what extent is artistic judgment an aptitude--that is, independent of training and education?

3. What are the relationships between artistic judgment tests and tests of other aptitudes? and

4. What is the evidence that artistic judgment tests are valid?

These questions have been the central focus of this investigation, which has included a critical review of research literature concerning artistic judgment testing; the construction of a new test of artistic judgment; and the administration of a battery of the most promising artistic judgment tests in studies examining internal structure, construct validity, and comparisons of scores of artists and nonartists.

The results concerning internal structure and construct validity have been reported in earlier technical reports (Technical Reports 1989-2, 1990-4) and are summarized below. This summary of internal-structure and construct-validity findings is followed by a summary of the results of the two studies presented in this report. Following these summaries is a discussion of several issues concerning the implications of this investigation into artistic judgment.

Summary of Internal Structure and Construct Validation

The internal-structure analyses (Technical Report 1989-2) showed the DJT and both scales of the VDT to have high reliability. The other tests in the experimental artistic judgment battery showed reliabilities that are low (or substandard, at best) by Foundation standards. When intertest correlations were computed, they were modest, suggesting these artistic judgment tests measure relatively independent aspects of visual preference.

Analyses of questionnaire responses showed that the DJT, VDT Simplicity, and (to a lesser extent) PA Consensus were significantly related to years of art training, highest level of art training attained, and art museum attendance. Analyses of scores on occupational interest scales also showed the DJT and VDT Simplicity to have significant relationships with interest in artistic occupations, with the DJT showing the higher correlations with several scales.

Analyses of the relationships between the experimental artistic judgment battery and the standard Foundation battery showed the experimental battery to be largely independent of the aptitudes tested in the standard battery, although individual tests in the experimental battery did show modest correlations with several aptitudes. These aptitudes included reasoning, structural visualization, and memory for design.

The studies of internal structure and construct validity were followed by studies of the visual preferences of artists, reported in this document. We review these results below.

Validation by Professional Artists

Study One. The primary purpose of this study was to compare the scores of nonartists and artists on the tests in the experimental artistic judgment battery. The artists consisted of paying Foundation examinees who worked in artistic fields, termed "examinee artists," and professional artists from several American cities who were recruited specifically for this study. The professional artists scored significantly higher than the examinee artists and the nonartists on the DJT and VDT Simplicity and significantly lower on VDT Uniformity, PA Consensus, PA .67, and the VAST. The largest differences in scores between professional artists and nonartists were on the DJT and the VAST. It should be noted, however, that the difference on the VAST was in the direction of the artists choosing harmony and balance less often than nonartists.

When we conducted discriminant analyses, we found that the DJT and VDT Simplicity and Uniformity in combination could effectively distinguish persons with visual preferences similar to artists. With a cutoff that identified 29.1% of the Foundation sample as being like artists, the discriminant function correctly classified 79.3% of the professional artists.

The findings regarding the internal structures and reliabilities of the experimental artistic judgment tests are, with small differences, similar for professional artists and nonartists. Comparing the two groups, the professional artists tended to be a little more consistent in their visual preferences than the nonartists, showing slightly higher reliabilities and item-total correlations. The

professional artists also showed a range of preference levels that was greater than the nonartists.

The intertest correlations showed that with a few exceptions, the relationships among the artistic judgment tests for professional artists were very similar to the relationships we found for nonartists. A notable exception was the correlations for the DJT. On the DJT, the professional artists showed a significantly stronger negative relationship with PA Consensus than for the nonartists, showing that the preference for asymmetry among artists is associated with the preference for shapes that differ from a group consensus. These findings are reinforced by the findings that the BWAS, which is generally scored for an aversion to symmetrical and concrete figures (see p. 28), was positively related to the DJT and negatively related to PA Consensus, again suggesting that the preference for asymmetry is related to a nonconventional preference for shapes.

The results of Study One show that each of the tests in the experimental battery isolates an aspect of visual designs that is distinctly associated with the preferences of professional artists. Because the tests do not share a strong common factor, each of the tests could make a unique contribution toward vocational guidance, although the DJT and the VDT, because of the results here as well as from the previous study of construct validity (see Technical Report 1990-4), appear to show the strongest potential for selecting persons with preferences similar to artists.

Study Two. The results of Study Two amplify the results that we obtained in the study of construct validity, showing that examinee artists and nonartists differ significantly on several aptitudes tested in the standard Foundation battery. Study Two showed examinee artists to score higher than nonartists on Inductive Reasoning, Structural Visualization, Memory For Design, Observation, and Tweezer Dexterity, with differences approaching statistical significance for Silograms, Finger Dexterity, and English Vocabulary. These results lend support to the speculation of researchers and philosophers concerning a fundamental relationship between artistic ability and intellectual ability (Arnheim, 1969, 1986; Ecker, 1963; Gardner, 1983), and we encourage further investigations in this area.

A comparison of the scores of examinee artists and nonartists on the COPS interest scales showed significant differences between their occupational interests in both artistic and nonartistic areas. Examinee artists scored significantly higher on interest in artistic occupations and significantly lower on interest in occupations in the areas of medicine, business and finance, and computation.

Origins of the Differences in Artistic Judgment Scores

The results of these studies, together with the results we reported concerning construct validation, are very consistent in the differences they show between artists and nonartists. Even after one controls for differences in age, sex, education, parents' education, and income, the results show artists and nonartists to differ substantially on several dimensions of visual preference.

Because the results of these studies show that tests of preference can distinguish artists and nonartists, they lead to a deeper question concerning the origins of these differences. In particular, do these differences arise from differences in educational background and training that were not controlled for in our analyses, as opposed to differences in underlying aptitude? If these differences are based in part on family and cultural background, is some portion of them derived from fundamental differences in human capacity?

For purposes of vocational guidance, as well as basic understanding of an important human capacity, a consideration of these issues is essential. Consequently, we propose a system of three alternative models to evaluate whether differences obtained in test scores reflect differences in an aptitude.

Model I is a pure trait view on abilities, viewing them as immutable human characteristics, and like many physical characteristics, ones that appear largely independent of experience or training. The normal growth of the organism is for the most part all that is necessary for the characteristic to appear, and thus it is (largely) independent of a person's environment. A wide variety of human characteristics fall in this category, such as body height, hair and eye color, and visual acuity.

Under Model I, some persons will be highly endowed with a particular ability, while most persons will have less ability in varying degrees. Abilities that fall in this model are especially applicable for aptitude testing because they do not change as a result of education and training, and thus knowledge of them and their influence on human performance is relatively stable and predictable.

Under Model II, persons are viewed as differing fundamentally in their potential to acquire a given ability. Whether persons realize their potential depends on their receiving appropriate stimulation in terms of family environment and education. Thus, individual differences in the ability reflect both differences in potential and differences in realization of potential, i.e., basic (probably genetic) endowment and environmental experience. Among the abilities that could be classified under Model II are many skills taught in schools, such as reading, arithmetic, and handwriting skills.

Under this model, the underlying potential would be considered an aptitude, but it is difficult to measure the aptitude directly, without the confounding influence of experience. Inasmuch as it could be measured, however, the aptitude would be important because it would indicate persons who could profit most from specialized training.

Model III represents the extreme environmentalist position, in which abilities are fully the product of experience and education. Thus, differences in test scores would reflect access to education and training and the opportunity to acquire specific knowledge and are entirely independent of genetic endowment. Some occupations that require special knowledge to operate machinery or equipment may be examples of Model III abilities.

In summary, these models can be used to clarify whether or not various abilities constitute aptitudes as the Foundation construes them, namely, "natural talents, special abilities for doing, or learning to do, certain kinds of things easily" (Johnson O'Connor Research Foundation, 1991). Inasmuch as a given artistic judgment test measures an aptitude, it is a candidate for addition to the Foundation's standard battery. (It would also have to satisfy several other requirements involving reliability and validity--see Statistical Bulletin 1984-8).

In terms of the tests studied here, some research (Eysenck, 1972b) has been conducted with the DJT that suggests that it is essentially free of cultural and educational influences, and children as young as seven years of age differ significantly in their scores. Little research has been conducted into the underlying nature of the other tests in the experimental artistic judgment battery.

Limitations of the Investigation

The results of these studies indicate that all of the artistic judgment tests have some degree of validity, although they vary in their validities and reliabilities. Because the tests appear to measure distinct traits involving artistic judgment, we believe that artistic judgment functions not as a single, unidimensional aptitude but rather as a complex of aptitudes. We have discussed issues concerning the status of these traits as aptitudes, and in the sections below, we discuss limitations of these studies that prevent us from drawing more-definitive conclusions at this time.

One limitation is the age range for the sample. In order to determine whether the artistic judgment tests measure aptitudes--i.e., whether they measure Model I, II, or III abilities--we need to study performances by younger examinees who have had differing types of experience and education. A controlled comparison across the school years would identify the extent to which test scores are aptitudinal in nature versus associated with training. To reiterate, because the samples in this

series of studies consisted primarily of adults, the extent to which their scores reflect the influence of training and education is not certain, and thus conclusions at this point concerning the status of artistic judgment as an aptitude are premature.

A second limitation of this study is the relatively narrow socioeconomic distribution of the Foundation sample. It is fairly racially homogeneous and economically affluent. Consequently, the empirical relationships that we report may be slightly underestimated due to the restricted range of the sample. In other words, the correlations and effect sizes would probably be somewhat larger in an unrestricted population. The characteristics of this sample also have implications for the generality of these results. Because the examinees in these studies do not represent the wide diversity of socioeconomic strata in American society, generalization of these results to other socioeconomic groups should be done with caution.

A third limitation is the use of contemporary professional artists as the criterion of external validity. The use of professional artists is an issue because the extent to which contemporary artists provide a valid basis for identifying an enduring association between artistic judgment and visual preference is not totally certain. While artistic expression is a continuous theme through the development of modern civilization, the use of professional artists as a criterion for artistic judgment is arguable. The function and role of professional art is associated with changes in civilization, and the artist during one historical period differs substantially from the artist in another period. Thus a criterion group of medieval artists and another from contemporary society probably differ significantly in their visual preferences in a number of respects. The social milieu in which the artist creates, not surprisingly, has a difficult-to-determine influence on how artistic aptitudes are expressed.

Because the tests in this study used specially-designed artwork, the use of professional artists is probably an appropriate means of validation. While we can not necessarily generalize our results to artists in earlier cultures, the use of specially-designed artwork does permit us to establish a framework for studying the preferences of artists that minimizes the influence of their training and personal artistic values and, because of the controlled characteristics of the designs, should continue to be useful in future studies. The approach we have taken thus offers an opportunity to establish continuity in a field that for over one hundred years has been characterized by fragmentation and discontinuity.

Implications for Artistic Judgment Testing

While we expect our results to transcend the confines of contemporary culture, the propositions that we offer about visual preference and artistic

judgment are necessarily cautious rather than definitive or absolute conclusions. Despite our reservations, these studies have important implications for artistic judgment testing, the most important of which concern the reliability and validity of artistic judgment tests. The results of the professional artist validation show that professional artists differed from nonartists on the DJT by .86 standard deviation units, which in theory means that about 80% of the professional artists obtained higher DJT scores than the average nonartist (excluding the examinee artists). This result suggests that artistic judgment tests may be very useful for identifying persons who have visual preferences similar to artists. The results from the discriminant analysis show even stronger evidence for the usefulness of these tests. When DJT scores were combined with scores on the Simplicity and Uniformity scales, 79% of the artists scored in the same range as the top 29% of the nonartists.

The results showed that the visual preferences of artists are not distinguished by only a single test or factor, but rather involve distinct preferences related to the symmetry, complexity, uniformity, proportions, and balance and harmony of visual designs. Consequently, the use of a single test for the purpose of guidance or selection would be less than optimal. Our consideration of this issue has led us to speculate on the role that the respective constructs underlying the experimental battery may have to artists in their production of art, which suggests their importance and effectiveness for identifying persons with artistic judgment. Ultimately, practical identification of persons with potential for art should probably rely on a combination of two or more of these tests, the selection of which will be based on further empirical analyses.

Implications for a Theory of Empirical Visual Aesthetics

The results of these studies contribute to the empirical knowledge that researchers have accumulated concerning artistic judgment, and they clarify several theoretical issues that are important for planning future studies. We discuss several of these issues below.

General artistic judgment factor. As we noted above, the evidence for a single factor is not strong. Moreover, we speculate that to some extent all the tests may reflect an influence of the occupational specialization into which an artist enters. Thus, when artists commit themselves to specialize in sculpture versus flat work, they, not surprisingly, probably assimilate a sensitivity to visual forms and structures that is unique to that area and to some extent shapes their future preferences. It is possible that the visual preferences of the budding professional artist have an inclination that is consistent with the visual values of a particular occupation but becomes stronger with experience. Consistent with this notion, the slightly higher intertest correlations that we obtained among the professional

artists on the artistic judgment tests than among the nonartists probably reflect their cumulative years of experience.

Our results, however, should not be interpreted to indicate that artistic judgment per se is empirically intractable or is not a mental capacity. On the contrary, the evidence shows very convincingly that it is comprised of several dimensions that we speculate form a constellation of aptitudes that predispose one for artistic production. The professional artist probably integrates these aptitudes during the course of a career, shifting their relative importance to each other depending on the particular artistic goal at hand.

The results from this series of studies are additionally impressive because they were conducted with two different populations, a Foundation sample and a professional artist sample. We found a number of correlations between artistic judgment scores and cognitive abilities for the Foundation examinees, and we found differences in mean artistic judgment scores between the professional artists and the Foundation examinees. Consequently, we believe these results represent empirical relationships and are not due to spurious statistical relationships among the test scores or artifacts of the testing conditions.

Underlying mechanism. In Bezruczko's review of background research for this series of studies (Technical Report 1988-1), he described a perceptual mechanism in which a person viewing a visual image decomposes the content into units of visual information. Psychologists studying the psychological and neurological aspects of perception first described this mechanism of visual decomposition, and Berlyne and others (Moles, 1958) applied it to the study of visual aesthetics. Berlyne in particular advanced the idea that artworks consist of information including semantic, syntactic, expressive, and cultural aspects that stimulate a viewer.

Other researchers have examined aspects of this model including the amount of time needed to process these units of information, as well as the influence of different types of visual information on preferences. The visual designs for the VDT were constructed on the basis of theoretical principles related to this perspective, and thus our interpretation of the results obtained by the Simplicity and Uniformity scales has assumed this model.

In other research that we have conducted using this perceptual model (Schroeder, 1990[8]), the components used in producing VDT designs were

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[8]The construction of the designs in this study followed the same rules that we used in the construction of the original VDT, but we incorporated higher levels of complexity by increasing the number of elements within designs and added components to, respectively, introduce color and manipulate levels of concreteness versus abstraction in the designs.

expanded to include higher levels of complexity, an additional color (red; the original VDT is in only black and white), and a contrast between concreteness and abstractness in the designs. When we analyzed preferences for these designs, the results supported the theoretical perspective of an underlying perceptual mechanism in which visual images are decomposed into discrete units of information. We even found that the systematic increase of information in the visual designs--i.e., greater complexity, an addition of color, and manipulating concreteness--significantly improved the empirical relationship between the model and the obtained visual preferences.

We found this perspective on visual perception to be useful both as a theoretical superstructure from which to undertake our investigation of artistic judgment and as a practical guide for constructing test items. We encourage other researchers to conduct further studies with it.

Individual differences. The status of artistic judgment as an individual difference domain, or unique human attribute, is difficult to establish because social values, cultural expectations, education and training, and socioeconomic background may have important influences on visual preference. Moreover, it is possible that the level of development of a society is part of a cultural foundation that influences visual preference, thus further complicating the influence that an aptitude such as artistic judgment may have on visual preference.

We have considered the associations between individual differences, cultural experience, and visual preference and have conducted analyses that control for some of these influences. It appears that the differences between the visual preferences of artists and nonartists are so large, even after controlling for differences in background, that they can not be accounted for entirely by cultural or educational variables. To some significant degree, artistic judgment may be a fundamental individual difference (i.e., aptitude).

The framework of three models that we presented earlier in this discussion is particularly useful for discussing this topic because individual differences under Models I and II are influenced by factors distinct from education and experience. When an individual difference does respond to special training, as many human

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These designs were administered to 200 Foundation clients, very similar in characteristics to the Foundation sample for this report. The presentation of the designs to this sample, however, differed from the earlier administration because examinees indicated their preferences among the designs by means of a Q-sort (Stephenson, 1953). Their mean preferences for the designs were then analyzed with multiple regression in which the item "difficulties," transformed to one-parameter logistic scale values, were regressed onto coded item components. The results showed that the item components accounted for almost 90% of the variance in the difficulty (preference) values.

abilities do, the core aspect that is related to underlying aptitude can still be expected to influence significantly a person's capacity to benefit from training, as well as establish limits on the facility with which acquired skills will be applied.

Berlyne's inverted U. An important contribution of Berlyne's psychobiological approach to artistic judgment was his proposition that visual preference for complexity follows an inverted-U function. This means that as complexity in a design increases, visual preference increases, up to a point beyond which additional complexity is associated with decreasing preference. Our results show clearly that artists and nonartists differ in their preferences for complexity in random visual patterns. Even after one controls for differences in socioeconomic background, the magnitude of this difference remains substantial. To attribute this difference simply to preference for complexity, however, may be an oversimplification of the dynamics that underlie visual preference.

In interviews conducted with the professional artists and some nonartists, Bezruczko found that the motivation for their choices differed sharply. The professional artists described an aversive reaction to the VDT designs with high complexity, implying that their preferences were influenced by the apparent meaninglessness of the random patterns. They described the designs with lesser complexity as showing more order and thus being more pleasing to them. The nonartists, on the other hand, described the more-complex designs as stimulating, while the less-complex designs were considered boring or uninteresting. As our results show, the preference of the nonartists for the more-complex designs was quite strong.

The dynamics that underlie the preference for complexity, as we have tried to show, are complex. We speculate that they are related to personality characteristics and have implications for persons' world views and, as Berlyne noted, are probably related in some way to persons' basic psychological needs. The results of this series of studies, however, strongly suggest that the purported relationship between the inverted-U function and preference should be examined more thoroughly.

While a revision of Berlyne's theory of arousal is beyond the scope of this report, our findings concerning a sizable difference between the responses of artists and nonartists to visual stimulation that varies in complexity suggest that a single function for all persons is probably not sufficient. Moreover, our results indicate that preference for complexity, especially by artists, appears to be moderated by other variables. In our analyses, we found that the uniformity of the pattern, in fact, reversed the overall preference of artists from simplicity to complexity, in comparison to the nonartists. While a relationship between degree of stimulation and complexity is probably fundamental to preference, further research is needed in this area.

In the following sections, we shift the focus of this discussion from the implications of these studies for the valid and reliable testing of artistic judgment, and the theoretical concerns of empirical aesthetics, to issues concerning the design of visual art. While the results that we have reported have practical implications for identifying persons who have visual preferences similar to artists, we would like now to consider their implications for the design of art.

Dimensions of Designs in Visual Art

These results provide insights into several aspects of visual art production that we did not anticipate in our original plan for this research. While we expected the results to show that artists and nonartists differ in their visual preferences on some of the tests, we were surprised to find that all the tests are associated significantly with the preferences of professional artists and thus by inference with the production of visual artworks. We consider the implications of these findings for the general study of visual design below, proposing several theses regarding visual design that are based on our measured preferences of contemporary artists.

Symmetry. First, contrary to the expectations of nonartists and art experts, symmetry is not an attribute of visual design highly preferred by professional artists.[9] In comparison with lay persons, professional artists in general show significantly greater preference for asymmetrical designs over symmetrical ones.

While our results do not indicate empirically the role that asymmetry has in more-complex art, we speculate that the artist uses asymmetry to achieve particular visual effects such as physical motion or emotional tension that may be essential in their roles for the artist. Likewise, the desire of an artist to direct visual attention and create interesting designs may instigate the manipulation of symmetry. In summary, asymmetry and its manipulation appear to play an important role for the artist as a design tool.

Balance and harmony. The influence of balance and harmony on the production of artwork, examined in this study via the VAST, seems less clear. The designs in the VAST are intended to reflect Eysenck's "T" factor, involving sensitivity to and preferences for balance and harmony. Because Eysenck's research focuses largely on the preferences of nonartists, the VAST appears to have been constructed to differentiate among nonartists. Consistent with this aim,

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[9]The preference for visual symmetry is a deeply entrenched value in Western culture. Consider the scoring of tests of human figure drawing commonly used by clinical and school psychologists. A figure that is drawn asymmetrically is scored as indicative of maladjustment (see Koppitz, 1968).

our report of internal structure (Technical Report 1989-2) showed that many of the items (simple designs showing large masses) in fact show adequate internal psychometric properties. When the scale was extended to artists, however, some validity issues began to surface, as noted earlier in this report. In our study, artists scored substantially lower on the scale than did nonartists. This suggests that the designs in the VAST (at least in the booklet form administered here) may fail to manipulate balance and harmony as they are construed by artists, and thus the role of balance and harmony in the production of art is unclear.

Complexity. The influence that the complexity of an artwork has on preferences, as we have noted previously, has not been well understood because much of the research that followed the early studies by Birkhoff and Eysenck has been poorly done. Researchers frequently failed to include artists and nonartists in the same study and have not always maintained rigorous control of the features in the designs used, sometimes failing even to control complexity. The result is that earlier studies have shown inconsistent findings concerning the influence of complexity on preference, which has led to substantial confusion and ambiguity in the field. We believe, however, that the outcome of this series of studies clarifies some of these issues, and we present our position regarding the role of complexity in the design of art below.

Superficially, our results show that artists prefer lesser complexity than nonartists when presented with random patterns. To conclude, however, that lesser complexity is an indicator of good visual design would be premature because fine art is widely recognized for its complexity, and a long tradition of philosophers have commented on the inherent complexity of artistic experience. Our consideration of this issue has led us to a view in which the role of complexity as an index of visual design depends upon the context of an artwork. Moreover, we believe that the critical feature of an artwork's context that influences the preference for complexity is its meaningfulness.

Determining the meaningfulness of an artwork, however, is ultimately bound up with its social context and, as the results in this report indicate, the preference for complexity is to some degree related to socioeconomic variables. In order to clarify the relationships among complexity, meaningfulness, and cultural influence, we have broadened our approach to visual design to include the influence of culture. Relying on informal observations, Bezruczko compared the art of more-developed and less-developed societies and found that they differ in their preferences for highly complex patterns. Less-developed societies in general tend to show more contrast and boldness in their visual patterns, frequently with many more elements (signs, symbols, and so on) than are generally found in Western art, and these elements frequently are imparted with special meaning, sometimes established by tribal or longstanding social custom. The art of less-developed

societies also seems to show less concern with the integration of many elements into a unified whole than is found in Western art.

We speculate that lesser preference for highly complex designs shown by Western culture may be a reaction to the relatively high levels of ambient sensory stimulation commonly found in more-developed societies. Consequently, art in more- and less-developed cultures, while similar in function, may differ in purpose.

One purpose of artists in modern societies appears to be the creation of visual objects that have a system of organization (often referred to as order and personalized by an artist into a particular style) that contrasts with the apparent disorganization and confusion commonly associated with urban experience. We can speculate that persons use these works of art to create a psychological space that serves as a refuge, and increasingly we find in contemporary Western art that content is nonrepresentational without particular emphasis on symbolic or shared meaning. Thus the experience of an artwork becomes an end in itself, and meaningfulness is thereby created by the viewer.

In less-developed societies, artists appear to use art to create patterns of visual stimulation with explicit embedding of symbolic content with widely shared meaning. These artworks appear to supplement the deadly routine and regularity common in these societies.

While our comparison of more- and less-developed societies emphasizes the key role of meaningfulness in understanding the influence of design on preference, the unique manner in which meaning is determined in Western societies suggests that it may no longer be useful for understanding art other than in general terms. Consequently, the close association between the preference for less-complex art and Western civilization makes the status of simplicity as a marker of good design unclear. The issue becomes even more difficult to assess after the influence of socioeoconomic differences is statistically partialled from the preference for simplicity. Our analyses show that approximately 50% of the difference between artists and nonartists still remains after partialling and suggest that to a substantial degree, the preference for less complexity is a basic aspect of visual design from the standpoint of artists in our society.

To some degree, the inconsistency between conventional wisdom and our research findings may be due to the manner in which complexity was manipulated in our studies. Complexity here was determined by the number of visual elements in a fixed amount of space, which represents only a single aspect of a conventional artwork. No attempt was made to create the type of complexity found in a finished artwork. Had we constructed designs in which many other aspects were manipulated to produce the intense and sometimes dramatic visual effects that are

typical of conventional artwork, the influence of complexity on the preference of artists would be more clear.

The results of these studies show that when visual designs are controlled so that preferences are only influenced by differences in the complexity of random patterns, artists clearly prefer less complexity. Future studies are needed to examine the relationship between preference for controlled designs and conventional artwork.

Uniformity. An unexpected result of this series of studies was the discovery of a psychometric factor involving the preference for uniformity versus movement in designs, with artists preferring less uniformity than nonartists. While this result is not particularly surprising, the items in the Uniformity scale of the VDT to our knowledge represent the first empirical isolation of this dimension of preference. The intertest correlations show that this factor is negatively related to the preference for asymmetry and largely unrelated to the other preference variables measured in the experimental battery.

Expressiveness. Some of the tests in the experimental battery administered to the Foundation examinees involve visual designs that were constructed under the restriction of strong controls. The designs in these tests were intended to vary in only one feature and to minimize the influence of other features. For example, designs within each Proportion Appraisal item vary only in their proportions and do not vary in their symmetry, complexity, and so on. In the study of professional artists, however, we included the BWAS, a test that has figures that were not tightly controlled in their construction, and thus differences in scores on it cannot be attributed to any single design feature. Researchers have speculated on the critical features distinguishing the positively- and negatively-scored items on the BWAS, such as complexity and concreteness, but as we noted earlier, none of these interpretations has been supported consistently by empirical studies.

Our interpretation of the scores on the BWAS is that they represent preferences for what may be called expressiveness in visual designs. All the figures that are scored for the Dislike response are devoid of emotional or expressive content, usually showing a simple concrete geometric figure that is centered bilaterally in the middle of the viewing plane. All the figures that are scored for Like, however, show some element of expression, either emotional or physical, and are more complex, usually with an asymmetrical arrangement. Consequently, high scores on the BWAS reflect a liking for figures that are complex, abstract, and asymmetrical, and a disliking for figures that are simple, concrete, and symmetrical.

Because the BWAS did not correlate with VDT Simplicity, which measures preference for complexity (versus simplicity), we eliminated complexity as the

primary influence on the preference for BWAS figures. The question of which other feature has greater influence, the abstract or the asymmetrical features of the BWAS, is difficult to assess because the association between the BWAS and the DJT is among the highest that we found between tests for the professional artists, suggesting a substantial influence of asymmetry. Yet when we examined the item difficulties for the BWAS, we found the asymmetrical figures with expressive content to be the figures most frequently preferred by professional artists. Our interpretation is that asymmetry has an important influence that is enhanced by the expressive content of the figure. The dissimilarity of the designs in the DJT and the BWAS also suggests that the BWAS measures an aspect of preference that is distinct from the other artistic judgment tests. Because expressiveness in a design appears to enhance the design's appeal to artists, further research should examine the status of expressiveness as a dimension of artistic judgment.

Independence of judgment. It is not surprising that artists showed significantly lower scores than nonartists when PA was scored on the basis of consensus choices. This finding may be related to personality characteristics of artists rather than an artistic judgment aptitude and reflect the independence of judgment (or even unconventionality of judgment) that researchers have linked with artists (Child, 1965; Getzels & Csikszentmihalyi, 1976). In contemporary Western society, success as an artist, in both fine-art and commercial settings, depends on creating new images, and thus the capacity to disregard contemporary consensual norms may be essential to the production of sufficiently novel work. Researchers have identified originality as one of the forces underlying advances in avant-garde art forms (see Crane, 1987).

In this regard, it is interesting to note that on all the artistic judgment tests administered to Foundation examinees, the artists were less likely to choose the "popular" responses than the nonartists. For example, on the Simplicity items in the VDT, the majority of the Foundation examinees chose the more-complex designs, and the examinee artists chose the less-complex ones (see Technical Report 1989-2, p. 30). Likewise, the professional artists were significantly more likely to choose the simpler designs (see Study One in this report). Thus, artists show a general tendency to have nonnormative visual preferences, although this pattern was certainly not universal among the artists we studied.

Golden section. When PA was scored for the ratio .67, the results were surprising because professional artists did not show a particularly strong preference for shapes that approximate the golden section, one of the most widely promoted principles in the area of art appreciation. In fact, they tended to show a stronger preference for shapes with the ratios of .50 and .75.

Our interpretation of this result is that, once again, the artist is showing a preference for designs that are unconventional or original. The golden section represents a common proportional relationship, occurring in natural settings as well as works of art. Mathematicians, for example, applying the geometric progression called the Fibonacci series, have argued that the golden-section ratio can be expected in nature (see Berlyne, 1971), and historians have shown its long association with the advance of Western civilization, from its occurrence in Sumerian heraldic designs, Romanesque cathedrals (Weyl, 1956), and the impressionism of Seurat (Ghyka, 1977). Consequently, the proportion is considered very traditional, and we speculate that contemporary artists do not find it particularly interesting and possibly consider it lacking in originality. As a result, the study of preference for the golden section as an aspect of artistic judgment probably depends on the appropriate historical context--in contemporary times, artists are more likely to reject than embrace golden-section proportions, at least in comparison to lay persons.

Summary of dimensions that influence artists. Nonartists, and experts in particular, often question the validity of statements describing the preferences of artists. Artists are commonly described as unique and unpredictable, and thus attempting to generalize about them is considered hopeless. Our results do in fact show that the differences among artists are greater than the differences among nonartists. But, as we pointed out above, the differences between artists and nonartists are sufficiently large that reliable generalizations can be made about how they differ from each other.

Our results show that artists in general tend not to like designs with bilateral symmetry or designs that show complex random patterns. When choosing between random patterns, artists tend to prefer simpler designs that show a semblance of order and harmony. Interestingly, when artists are shown complex patterns that are nonrandom, such as figures showing meaningful and expressive content, as on the BWAS, they show significantly higher levels of preference for them than do nonartists.

The preference for order noted above by artists, however, is relatively circumscribed. When choosing between a random design that is simple and uniform (extremely ordered, rigid) and another design that is more-complex and shows movement, the artist tends to show higher preference than nonartists for the more-complex alternative.

Method of Investigation

In our approach to artistic judgment, we have relied on psychometric methods rather than the nonquantitative methods commonly used in studies of art opinion and appreciation. While nonquantitative methods can be useful in describing the

impressions that artworks create in persons and characterizing the opinions that persons have about art experiences, they are difficult to utilize in an objective manner. Objective methods have several attributes, one of which is the use of methods to collect units of observation in a standardized manner. These units can be analyzed by researchers through their elaboration of a system of explicit rules such as a scoring key to identify patterns of order and consistency in observations. Less-objective methods frequently require judgments that rely on observers' personal opinions and are unique to a particular observation. The result is that objective methods can produce findings that can be replicated and ultimately accepted as objective facts. While less-objective methods do produce valuable insights into a phenomenon, their uniqueness limits the possibility of replicating them, thus undermining the attempt to produce general understanding. Because objectivity from our perspective is the separation of the researcher from the context of an observation, it permits the elimination of the influence that personal opinion or background has on the results of a scholarly study.

In these studies of artistic judgment, an objective perspective is essential in order to produce knowledge that can be useful for assessing human ability and, when possible, providing guidance to persons concerning their careers. These considerations have led us to use a psychometric approach that employs objective observation to identify empirical relationships.

A consequence of this approach is the controlled isolation of an aspect of human behavior, in this case visual preference, and then, through validation analyses, an insight into the meaningfulness of the relationships that were obtained. Through this method of isolation and generalization, we show how test scores can lead persons to self-knowledge and self-awareness in a way that would be difficult with nonquantitative methods. While we are cognizant of the argument that our methods of investigation are not appropriate for the uniqueness of artistic judgments, our fundamental commitment is to the identification of general relationships that transcend individual artistic experience and thus form a basis for shared knowledge and understanding.

Broader Social Implications

This series of studies of artistic judgment has emphasized the linkage between visual preference and aptitude. Its purpose has been to address specific research questions concerning the reliability and validity of artistic judgment testing. The results, however, have broader implications beyond aptitude testing. As we conclude this line of research, we will comment on them briefly.

The products of artistic creation, and the associated visual preferences of artists, receive wide recognition for their central role in the function of a society, portraying the best of humanity, as well as its worst, continuously assessing and

questioning social values while transmitting them. The function of art as a means of communication--for traditional societies, communication that is integral to their religious practice--has been identified by anthropologists and philosophers. In our discussion of the preference for lesser complexity, we also speculated on the psychological function that art serves in modern societies.

The results of these studies add another dimension to our understanding of art's role in society because they suggest that the experience of art is related in ways that are not yet clear to the development of cognitive abilities. Our evidence for this proposition is the wide-ranging relationships between visual preferences, cognitive abilities, and background variables that we obtained (Technical Report 1990-4), suggesting that experience in the visual arts may have an influence not only on the development of artistic judgment ability but on cognitive ability as well. It is possible that during the developmental years, the systematic exposure of children to aspects of visual experience related to the constructs underlying the experimental tests may have practical implications, not only for producing visual designs, but for qualitatively influencing the levels of cognitive abilities that emerge in the course of development.

Future Studies

This series of studies has addressed questions concerning the reliability and validity of artistic judgment testing, showing clear associations between several features of visual designs and the preferences of professional artists versus lay persons. These results, however, do not address several questions concerning the origins of these differences, nor the influence of education or training on preference judgments. Nor have we made an attempt to address the influence of culture on scores or the relationship between scores and personality characteristics (except for objective versus subjective personality). While we have identified relationships between visual preferences and various cognitive abilities, we have not explored the underlying dynamics of these relationships. The relationships may reflect the results of particular training or experience and not a general aspect of human development. On the other hand, artistic judgment dimensions may be fundamentally related to the development of cognitive abilities. Some researchers have argued that artistic expression is the precursor to verbal forms of expression, both oral and written (see Gardner, 1980, 1983). These questions remain unanswered, and we encourage researchers to conduct the following studies:

1. A study of artistic judgment that examines its development. In order to clarify the status of artistic judgment as an aptitude, the test scores of children who receive art instruction in school and those who do not should be examined. A study of this kind, conducted over a wide range of ages, from young children through college, would provide considerable insight into the status of artistic

judgment as an aptitude. Ideally, these comparisons should include samples that cross subcultural boundaries.

2. A study that examines the influence of artistic judgment on other aptitudes. Because of artistic judgment's wide-ranging associations with cognitive abilities, this study would examine the influence that art training during the developmental years, including before enrollment in primary school, has on the growth of cognitive abilities. Assuming testing of the cognitive abilities of children when they enter primary school and recording of the extent of their art training, subsequent testing at later grades can be expected to begin to show the influence that art training has on cognitive performance and partially explain the significant correlations between artistic judgment scores and cognitive abilities that we reported in Technical Report 1990-4. This study would clarify whether artistic judgment is an independent aptitude or group of aptitudes or an aptitude that interacts with the development of other aptitudes, instrumentally influencing the tangible skills that a person acquires.

A retrospective study within the Foundation using a background questionnaire that is followed up with selected phone interviews would also provide insight into the influence of art training on cognitive abilities and occupational interest.

3. Related to the issues described above, a study examining the relationships between visual preferences and personality characteristics. Based on other research, we speculate that persons with visual preferences for high complexity will show a predisposition for risk-taking behaviors (Zuckerman, 1979). Further research should examine relationships with risk-taking behaviors in conjunction with extraversion and other personality characteristics.

4. Studies examining the relationships between visual preferences and creativity. In our analysis of the artistic background questionnaire (Technical Report 1990-4), we found visual preferences to correlate with the design and production of original art objects. We speculate that experience in the original production of art plays a central role in a person's decision to choose an art-related career.

SUMMARY AND RECOMMENDATIONS

The two studies in this report yielded the following findings:

1. Professional artists score significantly differently from nonartists on all the tests in the experimental artistic judgment battery. The magnitude of the differences ranged from .38 to .87 standard deviation units.

2. Analyses of internal structure for the professional artist sample indicate that the tests' measurement properties for artists are comparable to those for nonartists. With the exception of the DJT, alpha reliabilities for the professional artists are slightly higher than for nonartists.

3. Intertest correlations for the professional artists indicate that the relationships of the tests to a single factor is relatively weak, as reported for nonartists. The BWAS, however, included in the study of professional artists, showed higher correlations with PA Consensus and the DJT than expected. Because of its relationships with these tests, a study should be conducted to determine whether it represents a distinct dimension of artistic judgment.

4. Comparisons between examinee artists and nonartists on the standard Foundation battery showed significant differences on the following scores: Inductive Reasoning, Structural Visualization, Paper Folding, Memory For Design, Observation, and Tweezer Dexterity. The differences ranged from .28 to .41 standard deviation units. Trends were found between artist status and tests measuring Analytical Reasoning, Silograms, Finger Dexterity, and English Vocabulary, although these relationships were smaller in magnitude.

5. Comparisons between examinee artists and nonartists on the COPS interest scales showed significant differences on the scales for artistic occupations. The magnitude of the difference on the Arts-Design scale was .72 standard deviation units. The results also showed significantly less interest by artists than nonartists in occupations related to Science-Medical-Life, Business-Finance, and Computation.

6. The DJT and the Simplicity and Uniformity scales of the VDT appear to be appropriate for the Foundation's standard battery because they have good reliabilities, they are distinct from the tests currently in the standard battery, and they are valid in terms of distinguishing between professional artists and nonartists. As indicated by the discriminant analysis, a combined "artist similarity" index might be a useful measure of the degree of similarity between a given Foundation client's visual judgments and the judgments of artists.

7. Further research should be conducted on the relationship between artistic judgment and education and training in the visual arts. It would also be desirable to study further the relationships between artistic judgment and personality traits and the relationships between the development of artistic judgment in children and the development of other aptitudes.

REFERENCES

Arnheim, R. (1969). *Visual thinking*. Berkeley, CA: University of California.

Arnheim, R. (1986). *New essays on the psychology of art*. Los Angeles: University of California Press.

Attneave, F. (1956). The quantitative study of shape and pattern perception. *Psychological Bulletin, 6*, 452-471.

Attneave, F. (1957). Physical determinants of the judged complexity of shapes. *Journal of Experimental Psychology, 53*, 221-226.

Attneave, F. (1959). Stochastic composition processes. *Journal of Aesthetics and Art Criticism, 17*, 503-510.

Barron, F. (1953). Complexity-simplicity as a personality dimension. *Journal of Abnormal and Social Psychology, 48*, 163-172.

Barron, F. (1963). *Creativity and psychological health*. Princeton, NJ: Van Nostrand.

Barron, F. (1982). Images: The universal language. In W. Schrader (Ed.). *New directions for testing and measurement: Measurement, guidance, program improvement*. San Francisco: Jossey-Bass.

Barron, F., & Welsh, G. (1952). Artistic perception as a possible factor in personality style: Its measurement by a figure preference test. *Journal of Psychology, 33*, 199-203.

Berlyne, D. E. (1971). *Aesthetics and psychobiology*. New York: Appleton-Century-Crofts.

Berlyne, D. E. (1974). *Studies in the new experimental aesthetics: Steps toward an objective psychology of aesthetic appreciation*. Washington, DC: Hemisphere.

Bezruczko, N., & Schroeder, D. H. (1990, August). *Construction and validation of a scale for Eysenck's K factor*. Proceedings from the XIth International Congress on Empirical Aesthetics, Budapest, Hungary.

Birkhoff, G. P. (1932). *Aesthetic measure*. Cambridge, MA: Harvard University Press.

Birkhoff, G. P. (1956). Mathematics of aesthetics. In J. Newman (Ed.), *The world of mathematics* (Vol. 4, pp. 2185-2195). New York: Simon & Schuster.

Brighouse, G. (1939). Variability in preferences for simple forms. *Psychological Monographs, 51*, 1-22.

Cashdan, S., & Welsh, G. S. (1966). Personality correlates of creative potential in talented high school students. *Journal of Personality, 34*, 445-455.

Carroll, H. A. (1933). What do the Meier-Seashore and the McAdory tests measure? *Journal of Educational Research, 26*, 661-665.

Champa, K. S. (1985). *Mondrian studies*. Chicago: University of Chicago Press.

Child, I. L. (1964). Observations on the meaning of some measures of esthetic sensitivity. *Journal of Psychology, 57*, 49-64.

Child, I. L. (1965). Personality correlates of esthetic judgment in college students. *Journal of Personality, 33*, 476-511.

Cohen, J. (1990). Things I have learned (so far). *American Psychologist, 45*, 1304-1312.

COPS. (1983). *Career Occupational Preference System*. San Diego: Educational and Industrial Testing Service.

Crane, D. (1987). *The transformation of the avant-garde*. Chicago: University of Chicago Press.

Dorfman, D. D. (1965). Esthetic preference as a function of pattern information. *Psychonomic Science, 3*, 85-86.

Ecker, D. W. (1963). The artistic process as qualitative problem solving. *Journal of Aesthetics and Art Criticism, 21*, 282-290.

Eisenman, R. (1966). The association of random shapes revisited. *Psychonomic Science, 6*, 397-398.

Eisenman, R., & Rappaport, J. (1967). Complexity preference and semantic differential ratings of complexity-simplicity and symmetry-asymmetry. *Psychonomic Science, 7*, 147-148.

Eysenck, H. J. (1940). The general factor in aesthetic judgements. *British Journal of Psychology, 31*, 94-102.

Eysenck, H. J. (1941). Type factors in aesthetic judgements. *British Journal of Psychology, 31*, 262-270.

Eysenck, H. J. (1957). *Sense and nonsense in psychology*. Baltimore, MD: Penguin.

Eysenck, H. J. (1967). Factor analytic study of the Maitland Graves Design Judgement Test. *Perceptual and Motor Skills, 24*, 73-74.

Eysenck, H. J. (1968). An experimental study of aesthetic preference for polygonal figures. *Journal of General Psychology, 79*, 3-17.

Eysenck, H. J. (1970). An application of the Maitland Graves Design Judgement Test to professional artists. *Perceptual and Motor Skills, 30*, 598-590.

Eysenck, H. J. (1972a). Personal preferences, aesthetic sensitivity and personality in trained and untrained subjects. *Journal of Personality, 40*, 544-557.

Eysenck, H. J. (1972b). The development of aesthetic sensitivity in children. *Journal of Child Psychology and Psychiatry, 13*, 1-10.

Eysenck, H. J., & Castlé, M. (1970a). A factor-analytic study of the Barron-Welsh Art Scale. *Psychological Record, 20*, 523-525.

Eysenck, H. J., & Castle, M. (1970b). Training in art as a factor in the determination of preference judgements for polygons. *British Journal of Psychology, 61*, 65-81.

Eysenck, H. J., & Castle, M. (1971). Comparative study of artists and nonartists on the Maitland Graves Design Judgement Test. *Journal of Applied Psychology, 55*, 389-392.

Fechner, G. T. (1865). Weber die fragen des golden schnitts. *Archiv. f. d. Zeichenenden Kuenste (Nauman-Weigel), 11*, 100-112.

Fechner, G. T. (1876). *Vorschule der aesthetik*. Leipzig: Breitkopf & Hartel.

Gardner, H. (1980). *Artful scribbles*. New York: Basic Books.

Gardner, H. (1983). *Multiple intelligences*. New York: Basic Books.

Garner, W. R. (1970). Good patterns have few alternatives. *American Scientist, 58*, 34-42.

Getzels, J., & Csikszentmihalyi, M. (1969). Aesthetic opinion: An empirical study. *Public Opinion Quarterly, 33*, 34-45.

Getzels, J., & Csikszentmihalyi, M. (1976). *The creative vision: A longitudinal study of problem finding in art*. New York: John Wiley & Sons.

Ghyka, M. (1977). *The geometry of art and life*. New York: Dover Publications, Inc.

Golann, S. E. (1962). The creativity motive. *Journal of Personality, 30*, 588-600.

Götz, K. O. (1981). *VAST: Visual Aesthetic Sensitivity Test*. Düsseldorf, Germany: Concept Verlag.

Götz, K. O., & Götz, K. (1974). The Maitland Graves Design Judgment Test judged by 22 experts. *Perceptual and Motor Skills, 39*, 261-262.

Götz, K. O., Lynn, R., Gorisy, A. R., & Eysenck, H. J. (1979). A new visual sensitivity test: I. Construction and psychometric properties. *Perceptual and Motor Skills, 49*, 795-802.

Gough, H. G. (1961). Techniques for identifying the creative research scientist. In *Conference on the Creative Person*. Berkeley Institute for Personality Assessment and Research, pp. 1-27.

Graves, M. (1946). *Design Judgment Test*. New York: The Psychological Corporation.

Graves, M. (1948). *Design Judgment Test: 1948 manual*. New York: The Psychological Corporation.

Haber, R. N., & Hershenson, M. (1965). Effects of repeated brief exposures on the growth of a percept. *Journal of Experimental Psychology, 69*, 40-46.

Johnson O'Connor Research Foundation. (1991). *Inventory of aptitudes and knowledge*. New York: Author.

Kellet, K. R. (1939). A gestalt study of the functions of unity in aesthetic perception. *Psychological Monographs, 51*, 23-51.

Koffka, K. (1935). *Principles of gestalt psychology*. New York: Harcourt & Brace.

Köhler, W. (1920). *Die physischen gestalten in ruhe und im stationaren zustand.* Erlangen: Weltkreisverlag.

Koppitz, E. M. (1968). *Psychological evaluation of children's human figure drawings.* New York: Grune & Stratton.

Külpe, O. (1903). Beitrag zur experimentaellen aesthetik. *American Journal of Psychology, 14,* 215-231.

Lang, R. J., & Ryba, K. A. (1976). The identification of some creative thinking parameters common to the artistic and musical personality. *British Journal of Educational Psychology, 46,* 276-279.

McAdory, M. (1929). *The construction and validation of an art test.* New York: Bureau of Publications, Columbia University.

McWhinnie, H. J. (1969). Some relationships between creativity and perception in fourth grade children. *Acta Psychologica, 31,* 169-175.

Meier, N. C. (1928). A measure of art talent. *Psychological Monographs, 39,* 184-199.

Meier, N. C. (1940). *Meier Art Tests: Part I. Art judgment.* Iowa City, IA: Bureau of Educational Research and Service, University of Iowa.

Meier, N. C. (1942). *Art in human affairs.* New York: McGraw-Hill.

Meier, N. C. (1963). *Meier Art Tests: Part II. Aesthetic perception.* Iowa City, IA: Bureau of Educational Research and Service, University of Iowa. 184-199.

Moles, A. (1958). *Information theory and esthetic perception.* Urbana, IL: University of Illinois Press. Originally published as Theorie de l'information et perception esthetique by Flammarian & Cie.

Moyles, E. W., Tuddenham, R. D., & Block, J. (1965). Simplicity/complexity or symmetry/asymmetry: A reanalysis of the Barron-Welsh Art Scale. *Perceptual and Motor Skills, 20,* 685-690.

Munsinger, H. L., & Kesson, W. (1964). Uncertainty, structure, and preference. *Psychological Monographs, 78,* No. 9, (Whole No. 586).

Noll, A. M. (1966). Human or machine: A subjective comparison of Piet Mondrian's "Composition With Lines" (1917) and a computer-generated picture. *Psychological Record, 16,* 1-10.

Noll, A. M. (1972). The effects of artistic training on aesthetic preferences for pseudo-random computer-generated patterns. *Psychological Record, 22,* 449-464.

O'Connor, J. (1940). *Unsolved business problems.* New York: Johnson O'Connor Research Foundation.

Research Memorandum 1989-3. *Item specifications for 84 forced-choice VDT items.* N. Bezruczko. Chicago: Johnson O'Connor Research Foundation.

Rosen, J. C. (1955). The Barron-Welsh Art Scale as a predictor of originality and level of ability amongst artists. *Journal of Applied Psychology, 39,* 366-377.

Rump, E. E. (1968). Is there a general factor of preference for complexity? *Perception & Psychophysics, 3,* 346-348.

Rump, E. E. (1977). Study of Graves Design Judgment Test and Barron-Welsh Revised Art Scale. *Perceptual and Motor Skills, 45,* 843-847.

Schaefer, C. E. (1968). The Barron-Welsh Art Scale as a predictor of adolescent creativity. *Perceptual and Motor Skills, 27,* 1099-1102.

Schroeder, D. H. (1990, June). *A Q-sort measure of artistic judgment.* Paper presented at the Midwest Objective Measurement Seminar, Chicago.

Statistical Bulletin 1984-8. *Minimum requirements for [a] test to become "standard".* Research Department & Executive Committee. Chicago: Johnson O'Connor Research Foundation.

Statistical Bulletin 1986-5. *Research proposal: Instrument for artistic judgment.* N. Bezruczko. Chicago: Johnson O'Connor Research Foundation.

Statistical Bulletin 1990-2. *Sex effects on JOCRF standard worksamples.* E. M. Veccia. Chicago: Johnson O'Connor Research Foundation.

Stephenson, W. (1953). *The study of behavior: Q-technique and its methodology.* Chicago: University of Chicago Press.

Technical Report 23. (1939). *Factors in Art Appreciation test. Worksample 172.* S. P. Horton. New York: Johnson O'Connor Research Foundation.

Technical Report 44. (1939). *Two experiments in the simplification of the measure of art appraisal.* S. P. Horton. New York: Johnson O'Connor Research Foundation.

Technical Report 99. (1942). *A further experiment in the measurement of proportion appraisal.* S. J. Lindstrum. New York: Johnson O'Connor Research Foundation.

Technical Report 251. (1946). *A study of Proportion Appraisal Worksample 235 Form B.* L. J. Quesnel. New York: Johnson O'Connor Research Foundation.

Technical Report 792. (1973). *Design Judgment research, Worksample 654 Form A, leading to Form AA: First purification.* I. C. Shambaugh. Boston: Johnson O'Connor Research Foundation.

Technical Report 859. (1978). *Factor analysis and complete set of intercorrelations of the Laboratory worksample battery.* M. Daniel. Boston: Johnson O'Connor Research Foundation.

Technical Report 1983-2. *Large-sample test intercorrelations.* M. Daniel. Boston: Johnson O'Connor Research Foundation.

Technical Report 1983-6. *Aptitudes of physicians.* M. Daniel. Boston: Johnson O'Connor Research Foundation.

Technical Report 1988-1. *Artistic judgment: A review of research.* N. Bezruczko. Chicago: Johnson O'Connor Research Foundation.

Technical Report 1989-1. *The aptitudes of dentists.* J. K. Bethscheider. Chicago: Johnson O'Connor Research Foundation.

Technical Report 1989-2. *Artistic judgment project I: Internal-structure analyses.* N. Bezruczko & D. H. Schroeder. Chicago: Johnson O'Connor Research Foundation.

Technical Report 1990-4. *Artistic judgment II: Construct validation.* N. Bezruczko & D. H. Schroeder. Chicago: Johnson O'Connor Research Foundation.

Thorndike, E. L. (1916). Tests of esthetic appreciation. *Journal of Educational Psychology, 7,* 509-522.

Trembly, D. (1974). *Learning to use your aptitudes*. San Luis Obispo, CA: Erin Hills Publishers.

Ward, W. C. (1968). Creativity in young children. *Child Development, 39*, 737-754.

Welsh, G. S. (1949). *A projective figure-preference test for diagnosis of psychopathology: A preliminary investigation*. Unpublished dissertation, University of Minnesota.

Welsh, G. S. (1959). *Welsh Figure Preference Test: Research edition*. Preliminary manual. Palo Alto, CA: Consulting Psychologists Press.

Welsh, G. S., & Barron, F. (1949). *Barron-Welsh Art Scale*. Palo Alto, CA: Consulting Psychologists.

Weyl, H. (1956). Symmetry. In J. R. Newman (Ed.), *The world of mathematics*. (pp. 671-724). New York: Simon and Schuster.

Wright, B. D., & Masters, G. N. (1982). *Rating scale analysis*. Chicago: MESA Press.

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Erlbaum.

APPENDIX A

Coding System for the Artistic Background Questionnaire for Foundation Examinees

(The questionnaire itself is shown in Figure 6.)

Item no.	Description	Code
1.	The emphasis on art in occupation	1 = art is not a primary emphasis 2 = art is a primary emphasis
2a.	Number of years of art training	1 = 1 or more introductory art courses without any specialization 2 = 1 year of art courses with an explicit specialty 3 = more than 1 year of training but less than 5 with 1 or more specialties 4 = 5 or more years of training
2b.	Art training specialization	1 = history or appreciation 2 = design of art objects 3 = production of art objects
2c.	Level of art training	1 = high school 2 = community college 3 = college 4 = art school
3a.	Number of years artistically employed	0 = 0 <1 yr = 1 1 yr = 2 2 yrs = 3 3 yrs = 4 4 yrs = 4 5-8 yrs = 5 9-11 yrs = 6 12-14 yrs = 6 15-18 yrs = 6 19+ yrs = 7
3b.	Dimensionality of artistic occupation	1 = two-dimensional flat work, e.g., painting, drawing 2 = three-dimensional, e.g., sculpture, flower arranging, stage sets
4.	Art volunteer experience	1 = administrative capacity 2 = design-related 3 = art-production-related 4 = teaching
5a.	Organization granting an art award (values ordered from lowest art specialization to highest)	1 = high school 2 = college 3 = art school 4 = museum 5 = commercial

		6 = hobby/club/newspaper/summer camp 7 = art show 8 = elementary school
5b.	Highest place awarded in an art contest	4 = first place 3 = second place 2 = third place 1 = fourth place
5c.	Frequency of art award	Coded continuously
7.	Visits per year to classical museums	1 = 1; 2 through 4 = 2; else = 3
8.	Visits per year to contemporary museums	1 = 1; 2 through 4 = 2; else = 3
9.	Number of artistically oriented magazines read on a regular basis	1 to 5 coded continuously; > 5 = 5
10.	Number of designs developed for projects	Coded continuously
11.	Total number of hobbies and other art activities	Coded continuously

APPENDIX B

Coding System for the Artistic Background Questionnaire for the Professional Artists

(The questionnaire itself is shown in Figure 7.)

Item no.	Description	Code
1a.	Type of training	0 = Noncommercial/fine art 1 = Commercial 2 = Mixed training: commercial & noncommercial 3 = Student 4 = Education
1b.	Location of training	1 = H.S./workshops 2 = Community college 3 = College/university 4 = Art school 5 = 1 & 3 6 = 1 & 4
2a.	Dimensionality of art work	2 = 2-Dimensional 3 = 3-Dimensional
2b.	Type of visual art engaged in	1 = Painting 2 = Drawing 3 = Photography 4 = Sculpture 5 = 1 & 2 6 = 1, 2, & 3 7 = Graphic art 8 = Wide-ranging art 10 = 1, 2, & 4 11 = Collage 12 = Textile 13 = 2 & 3 14 = Architecture 15 = Typography
3.	Art materials used in last project	1 = Water color 2 = Scratchboard 3 = Oil and canvas 4 = Ink and paper 5 = Acrylic 6 = 1 & 4 7 = Fabric 8 = Wide-ranging 10 = Mixed-media 11 = Photographic 12 = Steel 13 = Charcoal 14 = Clay

5a.	Recognition for art work	0 = noncommercial 1 = commercial 2 = student
5b.	Recognition for art work	1 = Newspapers, reviews, accepted for exhibit 2 = Honorable mention 3 = Third place 4 = Second place 5 = First place 6 = Combination of reviews, articles, and awards
5c.	Frequency of awards	1 = Low 2 = Medium 3 = High
7.	Do you or have you ever worked in an aesthetically-related occupation?	1 = Textile 2 = Commercial free-lance, self-employed 3 = Commercial/graphic design 4 = Illustrator 5 = Hairstylist 6 = Teacher 7 = Free-lance/self-employed, noncommercial 8 = Cartoonist 10 = Museum curator 11 = Architect 12 = Gallery owner
9.	If you do not work in an art occupation, what is your current occupation?	1 = Homemaker 2 = Student 3 = Computer programmer 4 = Real estate 5 = Teacher 6 = Office/clerical 7 = Financial investments
13.	Magazines	Coded continuously
14.	Artist code	1 = Commercial 2 = Mixed commercial & noncommercial 3 = Noncommercial

APPENDIX C

Psychometric Analysis of the Barron-Welsh Art Scale

Descriptive Statistics

Thirty-one professional artists completed the 60 scored items in the 86-item BWAS. Total scores were symmetrically distributed around 26, somewhat below the midpoint of the test, and ranged from 7 to 51 (M = 26.94, SD = 11.56, Mdn = 26). Scores showed slight skewing toward the high end of the test, and p values of the items ranged from .19 to .71. This group did not show ceiling or floor effects on this test.

Factor Analysis

A principal components factor analysis yielded three factors that had eigenvalues greater than 1.0 and showed interpretable item content. The eigenvalues were 9.6, 5.1, and 4.4, accounting for 22.9%, 12.2%, and 10.5% of the variance, respectively.

Factor 1 showed 17 items with positive loadings greater than .40 and no items with substantial negative loadings. With a single exception, keyed responses to all the items on Factor 1 reflect disliking for the figures. The figures for these items are extremely stark in appearance, showing primarily straight lines and curves, positioned in the center of the viewing field. These items consistently show bilateral symmetry in the layout for the figures, producing a stationary appearance. Many of them appear to be geometrical figures or designs produced by mechanical-drawing techniques commonly used by draftsmen. The p values for the items on this factor ranged from .26 to .58.

Factor 2 was a bipolar factor consisting of 15 items with positive or negative loadings greater than .30. Items loading positively on this factor are keyed for the Like response. These figures are generally abstract and impressionistic in their style, frequently relying on hand-drawn flourishes. Some figures (Nos. 21, 44, 69, and 79) show affective characteristics in their content, and, unlike the figures for Factor 1, the figures for many of these items show considerable horizontal movement. While these figures do not show bilateral symmetry, balance is achieved by the careful arrangement of visual elements and expressive forces. Items loading negatively in all instances are scored for the Dislike response, and their content is similar to the items for Factor 1. Item difficulties for Factor 2 ranged from .26 to .66.

Factor 3 was a bipolar factor similar in content to Factor 2.

Internal Structure

The item-total correlations for the BWAS are presented in Table 9. These values ranged from -.35 to .77, with an average of .34. In this administration to artists, twelve of the items (Nos. 6, 9, 14, 15, 25, 30, 40, 43, 44, 69, 70, and 83) showed low item-total correlations (i.e., less than .10). In all but one case, these items consist of figures drawn in an abstract or impressionistic style and keyed for the Like response. With one exception, the items with high item-total correlations (i.e., greater than .40) presented figures involving straight lines and curves producing well-defined concrete images resembling geometric designs, keyed for the Dislike response. The alpha reliability for the scored items on the BWAS was high, .91.

Item fit, assessed on the basis of values for an infit statistic (see Wright & Masters, 1982) to the Rasch model for the 60 scored items ranged from 2.00 to -2.30 with a mean of -.04. This approximates the item-fit distribution one would expect for a psychometrically sound test, but because of the small sample size, it is possible that some poor item fits were not detected.

Table 9

Item Statistics for the Barron-Welsh Art Scale for the Professional Artist Sample

Item no.[a]	Item-difficulty (p value)	Item-total corr.	Rasch infit	Item no.	Item difficulty (p value)	Item total corr.	Rasch infit
2	.36	.51	-.8	48	.36	.72	-1.5
3	.36	.51	-.4	49	.47	.19	-.5
4	.19	.17	-.3	50	.31	.35	.4
5	.37	.12	.8	51	.26	.43	-.5
6	.61	-.16	1.6	52	.60	.44	-.3
7	.28	.69	-1.1	55	.29	.34	.9
9	.58	-.15	1.7	56	.40	.69	-.6
11	.36	.68	-1.3	59	.44	.66	-1.6
12	.39	.37	.3	60	.60	.32	-.7
13	.58	.37	.1	61	.43	.68	-.9
14	.61	.01	2.1	62	.40	.55	-.9
15	.39	-.10	2.0	63	.40	.43	-.2
16	.25	.49	.1	64	.60	.41	-.3
18	.33	.76	-1.3	65	.41	.40	.2
21	.42	.27	.5	66	.51	.40	.2
22	.28	.59	-.6	68	.43	.46	-1.8
23	.53	.61	-.5	69	.66	-.00	1.2
24	.50	.31	-.8	70	.43	-.07	1.9
25	.36	.09	.7	71	.31	.46	-.5
27	.36	.72	-1.6	75	.37	.77	-1.6
28	.53	.12	.9	76	.57	.29	-1.0
30	.64	-.06	1.7	77	.43	.22	-.5
31	.56	.18	.6	80	.49	.10	1.0
36	.53	.21	-.9	81	.31	.62	-1.0
37	.47	.57	-.5	83	.29	.01	1.4
38	.44	.71	-2.0	84	.71	.35	-.9
39	.37	.32	1.5	85	.60	.26	-1.0
40	.39	.06	2.3				
41	.36	.54	.1				
42	.31	.60	-1.1				
43	.64	-.04	.6				
44	.42	-.14	2.0				
46	.47	.24	.3				

Note. N = 35. Items are scored in the direction of agreement with a criterion group of 37 artists and art students (see Barron & Welsh, 1952).

[a]We analyzed only the 60 items on the test that are keyed for liking or disliking of the total 86 items.

APPENDIX D

Bibliographical Information for the Professional Artists

Sex	Age	Artist classification*	City	Description
M	39	F	New Orleans	This artist has a B.A. in graphic arts from the Rhode Island School of Design. He is married to a sculptress, and together they own and maintain a gallery/studio in New Orleans. He exhibits primarily paintings and sculptures, and his last artwork prior to testing was a mixed-media work consisting of wood, wire, metal, and cloth.
F	62	F	New Orleans	This artist did not report any formal training. She started her career as an artist in photography, but now she concentrates on "naive" art that emphasizes a personal narrative using acrylic on masonite. She has had one museum show at the New Orleans Museum of Art and been reviewed widely in national newspapers such as the *New York Times* and the *Washington Post*.
M	34	F	New Orleans	This artist completed one year of college-level studio classes in drawing and painting. His interest now is in photography, and for the past 12 years, he has served as curator of photography for a museum of history and art. He is actively engaged in the production of art, specializing in a photographic technique that uses gelatin silver prints. He exhibits frequently in juried shows and has been reviewed widely in newspapers and periodicals.
F	40	M	New Orleans	This artist received one year of full-time training at the New Orleans Institute of Art in the areas of commercial and studio art. Her artwork is now concentrated on oil and acrylic paintings and some water colors, as well as pen and ink. She has received most of her recognition in local newspapers.
F	51	M	New Orleans	A native of Budapest, Hungary, this artist attended the Cleveland Institute of Art for two years and later took classes at Tulane University. She currently teaches at the New Orleans Academy of Fine Arts. Her emphasis

*The artists were categorized into three professional groups, namely, fine, commercial, and mixed fine/commercial artists.

				is on painting and drawing, and she has received awards in both local and national exhibitions. Her work is included in the private collection of the Texaco Corporation, and her work is currently displayed in galleries in New Orleans; Lake Charles, Louisiana; and Tampa, Florida.
F	40	M	New Orleans	This artist developed an interest in visual art as a young child, which led to formal instruction in universities and graduate school as an adult. She likes working with oil, pastels, pencils, and acrylics on canvas and exhibits her work at juried shows. She has received recognition in newspapers around the Southwest. For the past 10 years, she has been employed full-time as a graphic artist.
F	45	M	New Orleans	Maintaining residences in Italy and New Orleans, this artist completed one year of fine arts training and another year of study in textile design. Her interest is primarily in painting and drawing, although she does not show her art at juried shows. She currently works in the area of textile design.
F	32	M	New Orleans	This artist earned a B.A. in art and frequently exhibits at juried shows. She has been self-employed as a free-lance artist--painting, drawing, and working as a photographer--full time for three years.
F	39	M	New Orleans	This artist completed five years of university-level art training. She is primarily interested in drawing, painting, and photography, and she works professionally as a cartoonist, medical illustrator, and portrait artist. She exhibits her work widely at juried shows and has won awards at national and international shows.
F	50	M	New Orleans	This artist spent two years as an adult in an art school. Her interest is in portrait painting, and she exhibits her work extensively at juried shows and has won many awards and received recognition from local newspapers. She has had one museum show. For the past 15 years, she has been employed as commercial artist.
F	70	F	New Orleans	This artist completed two years of training in the College of Art at the University of Denver. She likes working with water colors and describes her work as semi-abstract, or impressionistic. She reported that she works with interior decorators, supplying them with artwork to meet specific design problems, but selling

				art is of secondary interest to her. She emphasizes that her painting is for her personal enjoyment.
F	67	F	New Orleans	This artist spent one and one-half years studying art at a junior college, and her favorite areas of art production are paintings and drawings. She exhibits her art regularly at juried shows, frequently winning top awards. She is employed as a hair stylist.
F	62	F	New Orleans	This artist has had little formal art training and is not employed, but has participated in juried shows, winning awards, for several years. She concentrates on oil painting.
M	28	C	New Orleans	This artist completed art classes in college, and his primary interested is in drawing. He is currently employed as an editorial cartoonist, and his work made him a finalist for a Pulitzer Prize.
M	43	F	New Orleans	This artist has a B.F.A. and concentrates on painting in water colors, acrylics, pastels, and ink. He has participated in juried national shows and has been self-employed for 18 years as a free-lance artist.
F	57	C	New Orleans	This artist spent two years studying commercial art at a vocational school and two years studying studio art in college. She has worked full-time as a commercial artist designing clothing and accessories for 34 years. She has received professional recognition for her work in advertising.
F	53	F	New Orleans	This artist began receiving recognition for her painting as a child and now concentrates on drawing and painting. She currently teaches painting to children and adults. She exhibits her work at juried shows and has received recognition for it. She spends about 35 hours per week on art and derives 80% of her income from art-related activities.
F	39	F	Chicago	This artist is a certified elementary-school art teacher who has taught art for eight years. She produces many forms of art, including painting, drawing, sculpture, and photography in her preparation of activities for school-children.
F	44	F	New York	This artist earned an M.A. in art from New York University, and she concentrates on sculptures from clay and welded steel. Although her art has been reviewed in magazines and she exhibits widely in juried competitions, she earns almost all her income outside of art.

M	42	F	New York	This artist earned a master's degree from the Pratt Institute in New York City, and he now concentrates on sculptures made from steel. He has held museum shows in New York and exhibits his art widely at juried shows. He works 40 hours a week on art and earns 100% of his livelihood from it.
F	45	C	New York	This artist completed two years of art school and has been self-employed in textiles for 25 years, both designing and hand-painting fabrics. She has also gained a reputation for her work in painting backdrops for stage sets, spending the last several years working for the theatre industry on Broadway in New York.
M	75	F	New York	This artist is from Connecticut and has completed one year of formal art training. For over 50 years, he has dedicated himself to painting and is widely known in New York City's art community through his shows and exhibits. Changing through the years, his style most recently has been described as abstract expressionist.
F	50	M	Chicago	This artist graduated with a fine arts degree in photography from Columbia College in Chicago. For the last eight years, she has worked as a free-lance photographer specializing in color photography using 35 mm and 2 1/4 mm formats, and she has exhibited her work internationally. Her primary source of income (80%), however, is from managing financial investments.
F	36	F	Chicago	This artist has earned a B.F.A. from the University of Illinois, and she concentrates on oil painting on canvas with special emphasis on human figures. She has exhibited her art widely in juried shows and has received recognition in Chicago newspapers. She is particularly well-known for her mastery of a style known as *trompe l'oel*. She spent several years trying to subsist on the income from her artwork but now treats it only as an avocation. She is employed full-time as an IBM systems programmer.
F	44	F	Chicago	This artist studied art at the college level for two years and has been self-employed full-time constructing paper sculptures for ten years. These sculptures are three-dimensional productions constructed from paper pulp, natural fibers, and paint. She does not exhibit her art at juried shows, although she promotes her work widely at art fairs.
F	43	F	Chicago	This artist has had no formal training and earns no money from her artwork but is currently working as an

				apprentice to an artist. She concentrates on oil painting on canvas and has begun showing her work.
F	35	M	Chicago	This artist has a B.A. in graphic design from the University of Illinois and has worked for over 10 years as a commercial artist. Outside of her employment, she produces water color works and drawings. Although she does not exhibit this art, she has sold several dozen works.
F	60	F	Chicago	This artist completed one semester of coursework at the Art Institute of Chicago and has maintained an involvement in art activities for over 25 years. Her interest is in the production of textile sculptures, which are three-dimensional productions constructed from fiber, glue, beads, and buttons. She exhibits regularly in juried shows and has received considerable attention in Chicago newspapers. She also teaches architectural history at a local university. She indicated very high satisfaction with her occupation, although she reported earning only 5% of her income from art activities, relying upon personal wealth for her living expenses.
F	27	F	Chicago	This artist has a master's degree in painting from the University of Northern Iowa and works full-time as a painter and illustrator. She has exhibited her art in several museums around the country and been elected to *Who's Who in Art in the Midwest*. She placed first in the National Award.
F	46	F	Chicago	This artist studied at the Art Institute of Chicago and now concentrates on painting in acrylic from photographs. She earns no income from her art.
F	28	M	Chicago	This artist has had little formal art training but produces art, concentrating on painting, collages, and crafts. For the past five years she has completed layout assignments for advertisements.
M	38	C	Chicago	This artist has a B.S. degree in Interior Design and works for an architectural firm. Although 100% of his income comes from his employment, he spends three to four hours a week in drawing and photography that he does not exhibit.
M	55	C	Chicago	This artist attended Northwestern University, the Illinois Institute of Technology, and the Art Institute of Chicago. For the past 35 years, he has operated a graphic design firm that specializes in advertising and has won many professional awards. He does not

				exhibit art at juried shows and indicated very high satisfaction with his occupation.
F	37	M	Chicago	This artist has a B.F.A. and an M.F.A., and she specializes in graphics and illustrations using a Rapidograph pen and ink on paper. She designs and produces brochures and illustrations, working for the past seven years as a self-employed graphic artist. Although she earns 100% of her income from her artwork, she indicated only medium satisfaction with her occupation.
F	36	M	Chicago	This artist has an M.F.A. She concentrates on drawing and painting, using charcoal and oil paint. She exhibits her work regularly in juried shows and has had a museum show. She has received recognition from national art journals, as well as local newspapers. She has been employed in art-related activities for eight years and is currently producing the illustrations for a nature book.
F	35	M	Chicago	This artist has completed six years of art training in the areas of drawing, painting, sculpture, and photography, as well as art theory and history. She now works primarily in photography, having spent the last five years as a commercial photographer. She exhibits artwork at juried shows and has had four museum shows. She has been recognized in Chicago newspapers and national art magazines and has been the recipient of an art grant.
F	32	M	Chicago	This artist has completed four years of college training in the visual arts, now concentrating on photography and graphic design. For the past ten years, she has worked as a free-lance graphic designer, although she does exhibit artwork at juried exhibits and has had several museum shows. She has been reviewed widely in art magazines and on television and has been the recipient of an art award.
M	33	C	Chicago	This artist has a degree in architecture and has been employed by a Chicago architectural firm for six years. During this time he has won awards for several of his projects, and all of them have been reported in the professional literature.
M	37	M	Chicago	This artist attended the University of California as an art major, as well as taking courses at the Academy of Art in San Francisco. His interests are in graphic design, calligraphy, drawing, and bookbinding, and he shows his artwork at juried shows. He has had one

				museum show. He earns a living as a self-employed graphic designer.
F	36	M	Chicago	This artist earned an M.F.A. in Basel, Switzerland, and has spent 13 years working in graphic design and commissioned art and teaching at the Art Institute of Chicago. She exhibits at juried shows and has received national and international recognition, both for her art and the art of her students.
M	34	C	Chicago	This artist has a B.F.A. and has been employed for 13 years as a graphic designer for the publications office of a national professional organization. He has received recognition from several professional societies although he does not exhibit his work at juried shows. His personal art is concentrated on photography and collage.
M	55	C	Chicago	This artist completed two years of study at the Art Institute of Chicago. His interests are in painting and drawing, and he has received professional recognition for his work. He does not exhibit his work at shows. For the past 35 years, he has worked as an illustrator for a firm that he and his partner operate.
M	35	F	Chicago	This artist has a B.F.A. in art education. He is interested in oil painting on canvas and likes to do murals and figurative pieces. He has exhibited his work widely in juried national shows, and he has had one museum show. He indicated very high satisfaction with his work in art, although he currently earns no money from it.
F	36	C	Chicago	This artist has a bachelor's degree in art and at the time of this study was a student at the Art Institute of Chicago. Her interest is in oil painting, although she does not exhibit her work at juried shows. For the past 14 years, she has worked in the area of visual merchandising and illustration.
M	21	M	Chicago	This artist is a student at the Art Institute of Chicago. His interest is in graphic design. He reported no prior work experience, although he reported that his work has been shown publicly.
F	21	M	Chicago	This artist is a student at the Art Institute of Chicago. Her interests are in graphic design, photography, painting, and drawing.
F	42	M	Chicago	This artist is a student at the Art Institute of Chicago. Her interests are in oil painting and drawing, and she

				reported that she has worked for four years as a technical illustrator for architectural and engineering firms. She did not report any participation in juried art shows.
F	19	F	Chicago	This artist is a student at the Art Institute of Chicago. Her interests are in drawing and painting, and she exhibits her work at juried shows.
M	21	F	Chicago	This artist is a student at the Art Institute of Chicago. His interests are in drawing and illustration using colored pencils.
M	24	--[b]	Chicago	This artist is a student at the Art Institute of Chicago.
M	27	--[b]	Chicago	This artist is a student at the Art Institute of Chicago.
F	25	M	Chicago	This artist is a student at the Art Institute of Chicago. Her interest is in drawing and graphics.
F	21	F	Chicago	This artist is a student at the Art Institute of Chicago.
F	36	C	Chicago	This artist has a B.F.A. and an M.F.A. in graphic design and is currently a student at the Art Institute of Chicago. She has worked for 13 years as a professional designer and currently owns her own office. She derives 100% of her income from artwork and reported very high satisfaction with her occupation.
F	57	F	Chicago	This artist has an M.F.A. She has worked as an artist for 30 years, concentrating on painting in acrylic and drawings. She does not exhibit her art in juried shows but sells her work through a Chicago fine-arts gallery.
F	45	2	Chicago	This artist has bachelor's and master's degrees in fine arts education. Her interests are in painting, drawing, sculpture, and crafts. She exhibits her work in juried shows and has received newspaper recognition for her art. She earns a living as a teacher of art.
F	42	2	Chicago	This artist completed a B.F.A. at the University of Chicago and concentrates on sculpture. She shows her work widely in both museums and galleries and has received many awards and commissions. For the past 13 years, she has divided her work between commercial and noncommercial projects.
M	31	2	Chicago	This artist has an undergraduate degree in international banking and a master's degree in graphic design. He is currently employed as the art director for a graphic

				design firm and has received wide recognition in professional trade publications.
M	56	C	Chicago	This artist is an architect trained at the Illinois Institute of Technology. He began his career on the staff of one of Chicago's major architectural firms but after a short time went into private practice, which he has continued for over 30 years. Listed in *Who's Who in the Midwest*, his architecture is widely acclaimed, and his projects are located internationally.
M	64	C	Chicago	This artist received his training as a commercial artist at the former Ray-Vogue College of Design in Chicago. He has worked as a graphic artist in his own office in advertising for over 35 years.
M	24	M	Chicago	This artist earned a B.F.A. from the University of South Florida and is now employed full-time as a graphic artist for an advertising firm. In addition to his employment, he spends 10 to 15 hours a week on personal art projects that involve paper, colored pencil, ink, and photographs, which he does not exhibit.
M	32	C	Chicago	This artist has an undergraduate degree in graphic design and illustration and a graduate degree in computer graphics. He works full-time in a graphic design studio but also engages in personal art projects involving board, ink, pencil, and acetate, for which he has received recognition from the Artist Guild of Chicago.

*Because these artists did not complete questionnaires and were not interviewed, insufficient information was available to classify their artist status.

APPENDIX E

Table 10

Correlations Among the Artistic Judgment Tests for the Professional Artists Not Corrected for Attenuation

Test[a]	DJT	SIM	UNI	PA C	PA .67	VAST	BWAS
Design Judgment Test		31		-50	-31		55
Visual Designs Test, Simplicity			31				
Visual Designs Test, Uniformity							
Proportion Appraisal (Consensus scoring)					73		-52
Proportion Appraisal (.67 scoring)							
Visual Aesthetic Sensitivity Test							
Barron-Welsh Art Scale							
Reliability[b]	.80	.93	.89	.85	.87	.76	.91

Note. *N*s range from 27 to 60. Leading decimals omitted. Only correlations significant at the $p < .05$ level displayed.

[a]Notation for tests: DJT (Design Judgment Test); SIM (Simplicity); UNI (Uniformity); PA C (Proportion Appraisal: Consensus scoring); PA .67 (Proportion Appraisal: .67 scoring); VAST (Visual Aesthetic Sensitivity Test); BWAS (Barron-Welsh Art Scale).

[b]Reliability coefficients are values for Cronbach's alpha calculated on this professional-artist sample.

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